RAILROAD GAZETTE

FRIDAY, SEPTEMBER 25, 1896.

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Contributions.

Elevation of Outer Rail on Curves.

Mass. Institute of Technology,
BOSTON, Sept. 21, 1896.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of Sept. 11, you gave an abstract of a paper on the elevation of the outer rail of curves, together with a table which shows the practice recommended by the committee of the Roadmasters' Association. In this table the elevation is directly proportional to the degree of curve. Some years ago, a section foreman stated to the writer, that in his judgment it was common to elevate the outer rail too much on sharp curves, and not enough on flat curves. Although the writer is engaged in work that many would consider theoretical, it has been his practice for many years to give full importance to practical facts; and, assuming for the moment that this statement of facts was correct, the writer tried to account for it, and a possible method seemed to him to be this: It is not probable that an engineer in making his run over a division will run at a uniform speed over the entire distance. His speed would naturally be decreased upon the sharp curves, and as it is necessary for him to make his time, it is very probable that the speed will be increased upon the flat curves and upon the tangents. If this is the way the trains are run, it certainly would be proper to elevate the outer rail of the curve by an amount which the actual speed should require, and this would result in a less elevation for the sharp curves, and a greater elevation for the flat curves. In the table which you gave, the results are obtained by a formula in which the speed is constant.

The writer brings this up more in the way of a question than of a suggestion, hoping that it may be possible to get some expression of opinion, both from locomotive engineers, as to whether the speed does vary enough to make a practical difference, and from roadmasters as to whether their observation of track leads them to think that a difference should be made.

C. FRANK ALLEN.

Copyright on Car-Accounting Blanks.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Some little time since I got up a new style of car record blank. It was based upon a series of experiments and represented, I thought, a decided improvement on the old size and style of car-record books. The clerks could do more work and the records were plainer. I showed the new blank to some of my brother car accountants and they approved of it; others sent to me for samples, and it seemed as if my new form were likely to be adopted on several other lines, when it occurred to me that I might as well copyright it. I know more than one car accountant who receives royalties on his copyrighted forms, and I have heard of an accountant in higher lines who does the same. Why should I not go into the royalty business?

Accordingly I sent the Librarian of Congress the necessary fee and a copy of my form, asking him to copyright it. After a due delay I received my money back with a polite but printed note from him, to the effect that by decision of the United States Supreme Court, blank forms or books cannot be protected under the copyright law. For further particulars he referred me to the case of Baker vs. Selden, 101 U. S., 99.

Now this struck me as pretty hard. Here were these other accountants, car and otherwise, collecting royalties on their copyrights, while I couldn't even get the copyright itself. It occurred to me, however, that the decision referred to might throw some light on this. Possibly it did not cover such a form as mine or theirs.

Accordingly I applied to a lawyer friend of mine who looked up the case, and let me read the reports. The case was tried in 1880, and the decision was given by Justice Bradley. It seems that one Charles Selden had written a treatise upon bookkeeping, in the end of which he had inserted a number of sample forms. These had been imitated by one Baker and Selden proceeded to sue him for piracy. Justice Bradley decided against Selden, using the following words:

"Blank account books" are not the subject of copyright, and . . . the mere copyright of Selden's book did not confer upon him the exclusive right to make and use account-books ruled and arranged as designated by him and described and illustrated in said book."

This seemed to be pretty bad for my chances. I might argue that car accounting was different from other accounting in that my form was to be used in connection with cars and not with money, but this was a pretty fine point, and by pursuing the case further this point was decidedly blunted by Justice Bradley's quoting with approval an opinion by Vice Chancellor Malin in a suit about a cricket blank, which stated: "To say that a particular mode of ruling a book constituted an object for a copyright is absurd." If this is law—and the Supreme Court says it is—then we all have a perfect right to use all the forms there are for accounting, whether they are nominally copyrighted or not. I can hardly understand, however, why any railroad has paid royalties on blanks and the like since 1880. T. C. P.

Couplers for Attaching Tenders to Long Cars.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I notice an article in a late number of one of your contemporaries on the derailment of tenders, on which the M. C. B. couplers are used, when passing severe curves; also incidentally referring to the difficulty of coupling and uncoupling with M. C. B. yokes, which give only ¼ in. lateral play each way from the center of the car. It seems strange, after so many years' use of the M. C. B. couplers, that this matter has not received more attention; but the old-fashioned and convenient link was still ready to do duty in these emergencies, when the cars could not otherwise be coupled.

As long ago as 1890 the fact that rigidly attached tender couplers were the cause of derailments and of jarring passengers in coupling to passenger trains on even a slight curve, was called to the writer's attention, who devised what is now known as the "McKeen tender hook." The first patent permitted the pivoted feature with lateral play; but seeing the necessity of the coupler coming to the center line, for ordinary coupling, another patent was taken out, covering the gravity feature for getting back to the center. Without this, one coupler might be pointing in one direction and the other in another, thus preventing coupling. Attempts have been made to accomplish the same results by the use of springs, but the couplers cannot be pulled around for coupling on severe curves, or on reverse curves. The only other locomotive coupler having the gravity feature and free lateral play is the "Trojan."

In 1891 I devised the carry iron, which is simple in construction and remedies all the difficulties referred to in the article which I speak of. It brings the couplers back to the center line of the car by coiled springs. The springs are never wholly compressed and they stand the service well. The New York, Ontario & Western has had about 150 cars equipped for over three years. These cars all have four-wheel trucks, and 2 in. lateral play each way is allowed. On the New York Central & Hudson River, the same length of spring is used, on six-wheel truck cars, with 3 in. lateral play on the carry iron. When this road first took the matter up, four years ago, there was constant difficulty in coupling and uncoupling while trains were in transit. After the cars were equipped with this device, the difficulty ceased.

No road that has tried them will do without them, and many believe that something of this kind is necessary to make the M. C. B. couplers a success even on the freight cars, where it has been found (on very bad reverse curves, where couplers with the M. C. B. yoke could neither be coupled nor uncoupled), that both coupling and uncoupling could be done with the carry iron with the greatest ease.

There was a case of derailment this summer, where a freight car was coupled to a horse car, which had the long-shank drawbar such as is used on passenger cars, in which the freight car was thrown off the track on a reverse curve. The car being replaced, it did the same thing twice afterward. If both cars had been equipped with a carry iron, 1-in. play on the freight and 2 in. on the horse car, the couplers would have kept on their own center line, and this would not have happened.

On a crooked road from 10 to 15 per cent. more cars can be hauled (as was evidenced by the pressure on the carry iron of 57,600 lbs. in tests made some time ago) than where there is no lateral play. Where there is free lateral play and no provision for bringing the coupler to the center when uncoupled, trainmen have to be continually going between the cars to put the couplers in the proper position for coupling. This defeats the very purpose of the M. C. B. type; but the gravity features of McKeen and the Trojan locomotive couplers meet the difficulty. T. L. M.

The Economy of Express Trains on Urban Railroads.

NEW YORK, Sept. 21, 1896.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of Sept. 11 you published a communication from my friend Mr. Theodore Cooper, on the subject of "Rapid Transit in the City of New York." In this letter Mr. Cooper presents a table based on a typical day's traffic on the Manhattan System showing approximately the station to station travel for all stations on the west-side roads. To the best of my belief, this is the first analysis that has ever been made showing the travel between stations, and although Mr. Cooper states that to a great extent this table is empirical and other tables may be made differing from this table according to the personal judgment of the analyst, nevertheless any such tables could only differ from Mr. Cooper's in details. In preparing this statement, Mr. Cooper has not only rendered a service to all those engaged in the study of the very intricate problem of rapid transit in New York, but has accomplished a real engineering feat, as he has demonstrated how a trained and philosophic mind can work out the basal facts of a problem, even where the statistics would to the ordinary observer seem hopelessly incomplete.

Toward the close of his article Mr. Cooper states, and submits reasons supporting his contention, that express travel on a rapid transit road will not pay. In the study of the rapid transit problem, an interesting feature has been the great divergence of opinion on this subject, the opinions varying all the way from the extreme on one hand, as represented by Mr. Cooper, to the extreme on the other of maintaining that only the fast traffic will pay, and that if a road were built for express service alone the greatest returns would be obtained on the investment. Of course, until the experiment is tried, all statements in this regard are largely matters of personal opinion, and the writer is of the belief that the best results will lie somewhere between the two extremes and be reached by a proper combination of local and express service.

Mr. Cooper's position may be summarized as follows: 1. That a 12-minute interval for express trains is a liberal allowance. 2. That the relative speeds of express and local trains should be taken at 27 and 16 miles respectively. 3. That his estimate of passengers using the express trains is based on station to station travel at certain arbitrarily selected express stations, and that passengers would not transfer from local to express trains to save time.

The major premise of his argument is contained in his first point. If an express service with 12-minute intervals between trains during the busy hours is all that a company could or would supply, there is practically no doubt but that Mr. Cooper's conclusion is correct.

A 12-minute interval, however, is a liberal basis for a suburban and not for an urban service. For an urban railroad such as the Manhattan or as the proposed rapid transit system would be, trains must run not only as rapidly, but as frequently as possible, and the interval is quite as important a factor in securing traffic as the actual speed of the trains. If the Manhattan interval were increased from one and a half minutes, which it is at present, to 10 minutes, it is quite possible to prove by Mr. Cooper's own principle of reasoning that it would be saving time for the great majority of the passengers to take the surface cars or walk, and with the improved methods of surface trains, it is on account of the frequency with which trains are run on the Manhattan system that its patronage is maintained. In the same way, if the cars of the Metropolitan Street Railway Company on Broadway were run at three or four minute, instead of 30 second, intervals, it is easy to show that the great majority of its passengers could save time by walking instead of taking the cars. Not only is this true so far as the passengers using the road are concerned, but unless the public can depend upon saving time, it gets into the habit of considering a given road as almost non-existent.

In the fiscal year 1887 the Manhattan system introduced a five-cent fare through the whole 24 hours, previous to which time it had been charging five cents during certain hours of the day and night and 10 cents during the remainder of the day. Previous to that its annual increase in travel had been from six to ten million passengers, and yet its increase during 1887 amounted to 44,600,000 fares as against a total business for the preceding year of 115,200,000, or a sudden increase of over 38 per cent. Of course, the natural conclusion would be that such suddenly abnormal increase without the addition of any new lines, would mean that the business was taken entirely, or almost entirely, from the surface roads. As a matter of fact, the surface roads showed a loss of only 8,000,000 passengers, and the total traffic gain for the city was 36,500,000, as against a normal increase of from 15,000,000 to 16,000,000 during the previous years. That is to say, the giving to the public of a fast service at no greater cost except the personal inconvenience of climbing the stairs, more than doubled the normal annual increase. It is interesting to note that this reduction in fare caused an increase not only in gross receipts of the Manhattan Company, but actually in the net receipts after paying operating expenses, and that the reduction of the fare was a source of increased revenue to the company.

If we use an interval of four minutes instead of 12, as the basis for an analysis (taking Mr. Cooper's own figures of travel between the express stations that he selected) practically all of the 47,630 passengers which he admitted as traveling between the express stations, would save time by using the express trains, instead of the 12,700 that he estimates on the 12-minute basis, or 32 per cent. of the total travel, instead of 8 per cent.

Mr. Cooper in his third point does not believe that the people will transfer from one train to another, and that therefore the total express business will be that between

express stations only. As he points out, the average journey on the West Side line is about 3.4 miles, but on the East Side the average is somewhat greater, and is increasing each year. On rapid transit lines where express trains will run, undoubtedly the average journey would be still greater, and a four-mile ride is a conservative estimate. Taking the average passenger therefore, and supposing that he had to travel half a mile on a local train and then transfer to an express, and that express trains were running at four-minute intervals, with an average wait at the transfer station of two minutes, a ledger account of the time in transit in minutes and decimals of a minute would be as follows, using Mr. Cooper's speeds of 27 and 16 miles:

By local train, 4 miles at 3.75 minutes	15 mins.
By local and express:	
½ mile at 3.75	1.88 minutes.
Time lost in waiting	2 "
3½ miles at 2.2 minutes	7.7 "
	11.58

A saving of 3½ minutes in the journey, or nearly 23 per cent. Mr. Cooper bases his belief that people will not transfer, on the great howl that has been raised against the transfer at 129th street from the Suburban to the main line of the Manhattan system. This does not seem to be to the point. At 129th street the people are obliged to transfer from one train to another and there is not only no compensating benefit, but a serious loss in time and great personal inconvenience. To see to what lengths people will go in the way of transferring where there is a benefit to be derived, a person has only to watch the south bound travel on the Third avenue road. Out of every three trains run, two go to City Hall and one to South Ferry, except a few scattering ones which stop at Chatham Square. On arriving at Chatham Square Junction, every City Hall train will unload a number of passengers destined for South Ferry points. These passengers knowingly take a City Hall train from uptown stations, when by waiting for the next or at the outside two trains, they can get a through train to their destination. They, however, take the first train that comes along in the hope of catching a Second avenue train at the junction. In order to take the Second avenue train they have to climb a steep flight of stairs, cross an overhead bridge, descend and walk the length of a long platform. In the morning the crowd may be seen to watch carefully, if two South Ferry trains are approaching simultaneously on the Second and Third avenue roads, to see which gets the signal, and then if the Second avenue train is given precedence, they run over the bridge to the other platform, although the resulting saving will not be more than 30 or 60 seconds. This is done not only by the young but by old men and women as well. It is as useless to argue with this crowd that the saving is inconsiderable compared to the inconvenience and personal exertion, as it is to argue with the man who will run two blocks on a hot day to catch a ferry-boat, when he knows that the next one will leave only a couple of minutes later.

Again, the Third avenue road during the busy hours in the afternoon runs each alternate train from City Hall as an express train. Inasmuch as these express trains are sandwiched between locals, the only benefit that can be derived from them is where they reach sections of third track, namely, north of Fifty-ninth street, and the greatest number of local trains that they can pass there is three, while frequently they do not pass more than two; yet passengers will leave the preceding local trains at Fifty-ninth street in order to take the express trains, although they know that these express trains are so crowded that a seat is an impossibility and that the gain will not be more than one or two trains. On the west side the express trains do not stop after leaving Franklin street until reaching 116th street, and yet passengers in large numbers on every express train will go to 116th street, which has an island platform, and then wait for a southbound local and go back, some as far as Eighty-first street, a distance of 1¾ miles or a total extra journey of 3½ miles, as by thus going beyond their destination they can save about three minutes.

It is the knowledge of these things that leads those who differ with Mr. Cooper in the other extreme to claim that the express train service will be the most used and, therefore, the most profitable. If people will resort to these expedients for the small saving in time that has been mentioned, is it unreasonable to suppose that where every facility is offered for a transfer, namely, merely stepping across an island platform, that passengers will avail themselves of it, when, as has been shown above, there will be a saving of 3½ minutes in 15? As a matter of fact the saving would be greater.

Mr. Cooper (and for the purposes of my argument I have used his figures) takes the relative speeds of 27 and 16 miles for express and local trains, basing his express service on stops about a mile apart. The express service interval as contemplated by the Rapid Transit Commission is somewhat greater than this—more than 1¼ miles. At the long investigation which was held before the Commission appointed by the Supreme Court last winter, the eminent experts retained by the opponents of the Rapid Transit enterprise admitted that the speed of express trains could be about 32 miles an hour and that of the local trains about 15 miles an hour. Using these speeds the saving with a transfer would be greater than herein indicated.

There is one fact in connection with the express service that must not be lost sight of—that express trains are more economically run than locals. Usually high speed means greater coal consumption and consequently more expensive service. With roads having frequent stops the coal consumption is enormously high on account of the great loss in energy through frequent acceleration and the immediate destruction of the momentum by the application of brakes. On the Manhattan system, with trains averaging 4½ light cars, the consumption of coal per train-mile is over 51 lbs. This is sufficient to run a heavy express train on a surface road at a very much greater average rate of speed. The consumption of coal, therefore, on express trains will be less, and as the journey would be made in shorter time, the wear and tear of the equipment would be less, and as the speed would be greater the same number of motors and cars during the course of the day would make a greater mileage, and therefore involve less capital expenditure in order to render the same service.

It will, therefore, be "business sense" on the part of the operating company to induce as many of its patrons as possible to take the long-distance trains. The Manhattan Company has never been charged with being extravagantly progressive, and yet it finds it profitable to run express trains, although they interfere with its local service, at an average interval during busy hours of 7 minutes with a minimum of 1½ minutes on its West Side line. On the East Side line the interval varies during the same time from 6 to 8 minutes. Even now there is pending before the Rapid Transit Commission an application on behalf of the same company for a permit to lay third tracks on all of its lines, in order that its express service may be increased.

The difference between Mr. Cooper and the writer is that the former believes that people will not freely transfer from local to express trains, while the latter believes that with the saving to be made people in large numbers will not hesitate to avail themselves of the accruing benefits. Of course, until the experiment is tried, this must necessarily be largely a matter of opinion, but the cases cited and others which have been observed would seem to confirm the opinion that faster trains will not be without a paying load.

WM. BARCLAY PARSONS.

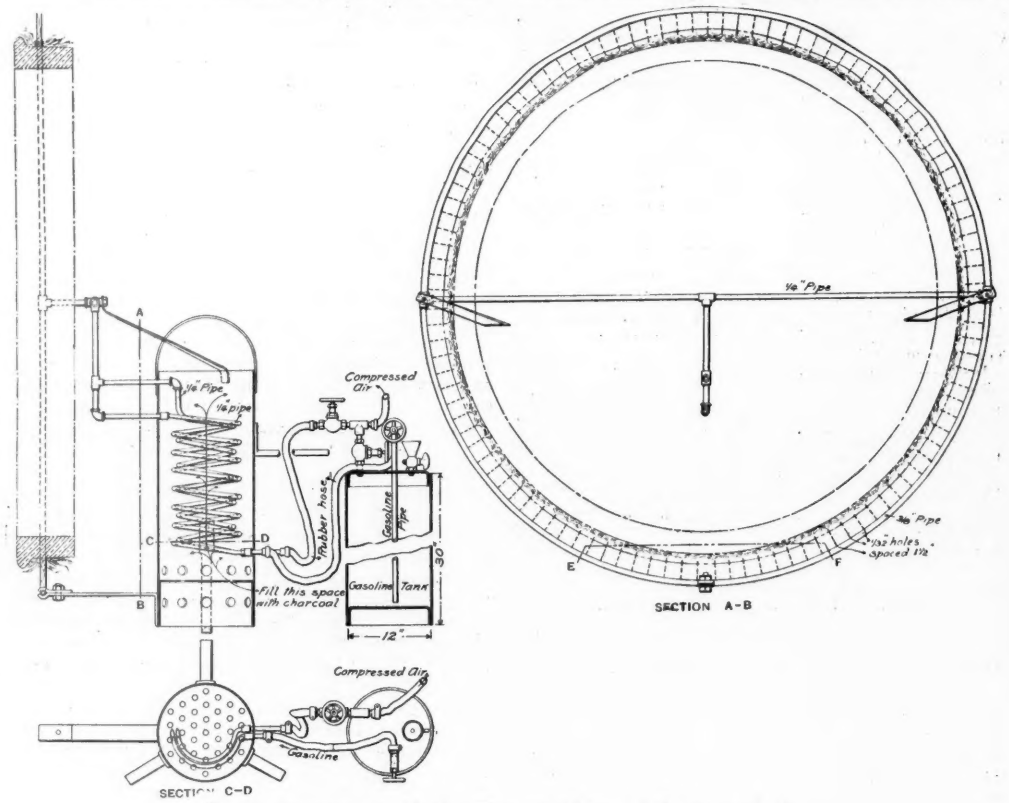


Fig. 1.—Apparatus for Heating Tires by Means of Compressed Air.

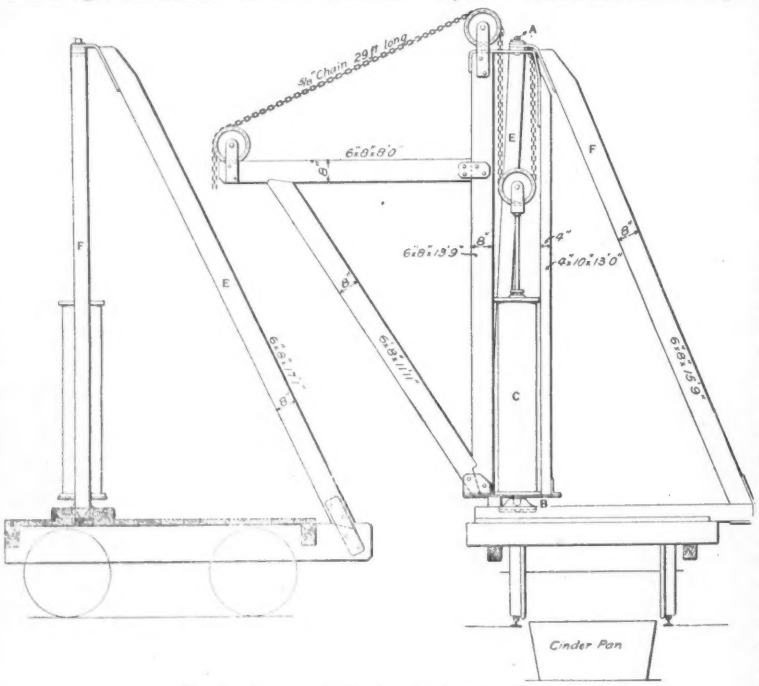


Fig. 2.—Pneumatic Device for Loading Cinders.

Compressed Aair in the Shops of the Missouri Pacific Railroad.

BY H. N. LATEY, S. B.

The many uses to which compressed air may be applied have long been appreciated. Its general adoption, however, has been slow, due, in a measure, to the badly designed and inefficient air compressors formerly used. The Missouri Pacific Railroad was one of the first to see the great convenience of air as a medium for the transmission of power, and in 1879 it was using portable drills operated by small, three-cylinder, single-acting air engines, with flexible shafts, tapping staybolt holes, boring cylinders and kindred work. The compressed air for these machines was obtained from Westinghouse air-pumps, and the use of compressed air was restricted almost entirely to this work until the introduction of the compressor in Oct. 1894.

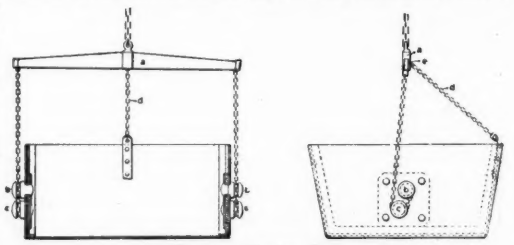


Fig. 3.—Cinder Pans.

In the main shops at St. Louis the compressed air is furnished by a Norwalk compound compressor, with dimensions as follows:

Diameter steam cylinder	14 in.
" low press. air cylinder	14 "
" high " " "	9¼ "
Stroke	16 "
Diameter steam pipe	3 "
" exhaust pipe	4 "
" air supply pipe	11 "
" " delivery pipe	4 "
" water pipe for cooling	1 "

This compressor, which is rated to deliver 427 cu. ft. of free air per minute compressed to 100 lbs., when running at 150 revolutions per minute, has been in operation constantly for 20 months with practically no repairs.

Air from the compressor is forced through a 4-in. pipe to a large upright receiver 6 ft. in diameter and 27 ft. high with a capacity of 735 cu. ft. of free air at atmospheric pressure of 5,634 cu. ft. at 100 lbs., the pressure usually carried. From this a 4-in. pipe leads as a feeder through the shop, branches extending in all directions, and at convenient places valves are placed to which any of the air apparatus may be attached.

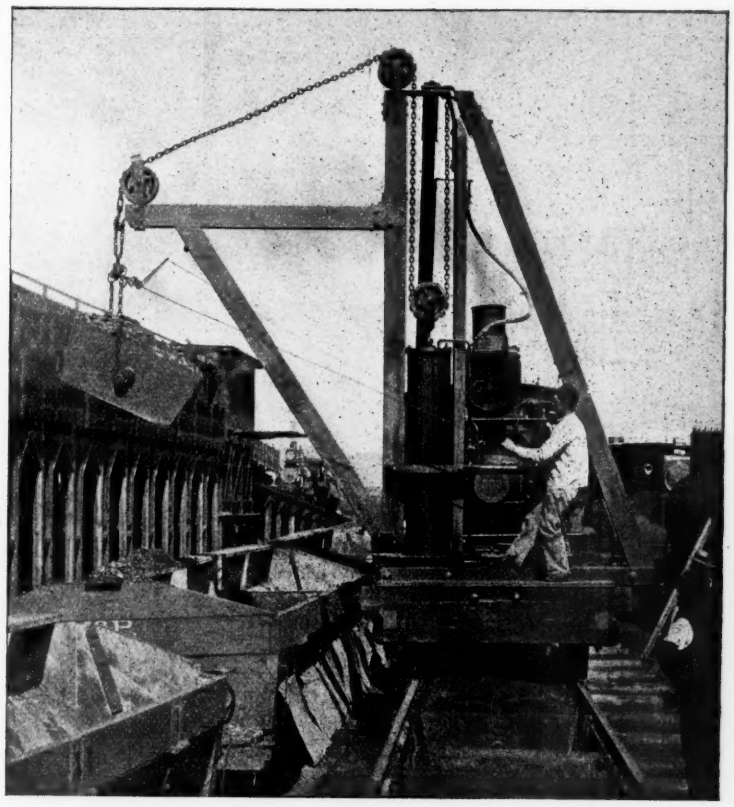


Fig. 4.—Crane Operated by Compressed Air.

Over each machine and bench is a traveling pneumatic hoist, of the well-known cylinder type, which greatly facilitates handling heavy work. Those hoists, which vary in size from 6-in. diameter, with a lifting power of 1,500 lbs., to 14-in. diameter, with a capacity of 4 tons, seem to have entirely displaced chain blocks for this work.

Drilling, tapping staybolt holes, screwing in staybolts, rolling boiler flues, re-boring cylinders and a large amount of similar work is done by air motors. There are two types of these motors, one a small, three cylinder, single-acting engine, commonly known as the "Brotherhood Engine," and the other, a small air turbine known as the Baird drill. Both of these machines give good results, the former being the more efficient. Clutches for holding staybolts, universal sockets for taps, a device for re-boring cylinders and a number of other special devices designed by the mechanical department of the shops, have greatly increased the usefulness of these motors.

The calking is nearly all done with pneumatic calking tools and a pneumatic press is used for pressing brasses into the rod-straps. A pneumatic crane loads and unloads heavy machinery, engines are coiled and sanded, cinders are loaded into cinder cars, freight cars are painted and seats and carpets are cleaned and dusted all by compressed air. In the oil house oil is transferred from one tank to another and barrels are raised and emptied into storage tanks, the regular attendant doing this alone with compressed air. In the storeroom is a pneumatic elevator and in the office compressed air operates the letterpress.

It is a very difficult matter to estimate the saving due to the use of this power, but it must be very material. It has reduced the force of common laborers 75 per cent. and has increased the capacity of the shops. The cost of operation is very small. There are few repairs, and the cost of compressing the air is scarcely noticeable in a large shop of this kind. Some experiments have been made which give 23 cents as the average cost per hour with coal at $1.50 per ton.

Compressed air as a motive power is now in use in all the Missouri Pacific shops. The variety of its applications is being constantly increased and pneumatic apparatus is being introduced wherever it shows signs of economy. Following is a description of some of the more important pneumatic apparatus in use by this road:

Heating Tires.

Fig. 1 illustrates a method of heating tires by using compressed air. Gasoline vapor and compressed air, which have been previously heated in a charcoal furnace, are mixed and blown through small holes in a circular pipe which completely surrounds the tire. This mixture lighted gives a blue flame all the way around the tire, and develops enough heat to remove a tire from a driving-wheel in about three minutes.

In the St. Louis shops, with this device, all the tires of a 10-wheel locomotive were removed and new ones put on in their place in six hours. This time includes taking down rods and guides and replacing them. The engine made 189 miles the same day.

Loading Cinders.

The device for loading cinders, shown in Fig. 2, consists of a crane mounted on a car, revolving on the pivots *A* and *B*. It is held upright by two 6 in. × 8 in. braces *E* and *T*, which are fastened 90 deg. apart to the deck of the car. The crane therefore has a rotation of about 270 deg. A three-way cock admitting air to the cylinder *C* controls the hoisting.

The cinders are dumped from the engines into pans in the cinder pit. When these pans are full the crane picks them up one at a time and empties them into a car on an adjacent track. A locomotive moves the crane over the pit and supplies the compressed air. Ballast under the deck of the car prevents it from tipping.

The cinder pans, Fig. 3, are made of ¼ in. iron riveted to angle-irons, and are so arranged that they right themselves after dumping. The pan is raised by two chains fastened to the ends of the rod *A*. These chains are brought under the pins *CC* and hooked over *bb*. The pan is then kept right side up by the chain (*d*), and as the pins *cc* are below and to one side of the center of gravity, as soon as (*d*) is released the pan turns completely over and remains hanging by *bb*. These pins are on the center line slightly above the center of gravity, consequently the pan will hang right side up ready to lower into the pit. The chain (*d*) is released by a tripping device at *E*.

This crane was designed and built entirely in the Missouri Pacific shops and has been in operation for four months. It is estimated that the saving of this apparatus amounts to $90 a month. Fig. 4 is a photograph of the crane in operation. The tripping device has just been released and the pan is in the act of turning.

Coaling Engines.

The device for coaling engines is shown in Fig. 5. Referring to the end view, there are three tracks spanned by a truss which supports a small truck. This truck is moved back and forth on the truss by a 6-in. horizontal cylinder. The coal bucket shown on the middle track is raised and lowered by an upright cylinder 14 in. in diameter by 12 ft. long. This cylinder is supported on the truck by a universal joint which allows it to swing and thus prevents bending the piston rod. The coal buckets are raised, pushed over the engine tender and, after they are emptied, they are moved back and lowered to their cars by one revolution of a specially designed valve.

The middle track has an incline of 6 in. in 60 ft. from both ends toward the center. The coal buckets, which are mounted on cars, are filled on one of these slopes and allowed to roll down to the hoist as required. The loaded buckets push the empty ones up the slope on the other side. As the coal bucket cars have roller-bearings, this method of control has proved very satisfactory.

The coal buckets, which were designed in the St. Louis shops, can be understood from the end view drawing. Pulling the lever shown on the side releases the catch on each end and the bucket opens in the middle. When the coal is entirely out, the bucket closes and locks itself. Fig. 6 gives a view of this device in operation.

This method of coaling engines was devised by Mr. W. B. Doddridge, General Manager of the Missouri Pacific System, to locate a coaling station where it was impossible to build a coal chute. It has been working very satisfactorily for six months, and there is a similar device in process of construction in the St. Louis shops.

Four-Ton Crane.

Fig. 7 is a general drawing of a four-ton crane operated by compressed air. A three-way cock admitting air to the cylinder (*c*) controls the hoisting. The crane rotates on two pivots, the lower supported in a step and the upper in a collar which is stayed to the surrounding buildings.

The rotative device, which is covered by a patent issued to Mr. Doddridge, is explained in the plan. (*R*) is a cylinder 6 in. in diameter fastened to the base (*S*) by iron straps. This base rests on rollers as shown in the drawing, and is free to move longitudinally. At the center of (*R*) in the position shown in the drawing is a piston fastened to both rods *P* and *P*. These rods are tubular, and each rod admits air to its end of the cylinder, having a number of ⅛-in. holes opening into the cylinder close to the piston head. As the piston rods are permanently fixed to angle-irons at *TT*, the admission of air to the cylinder will force it lengthwise toward *T*. Fastened to the cylinder is a rack which runs in the gear (*G*), and this gear is bolted to the base of the upright of the crane. From this it will be seen that any motion of the cylinder *R* will involve the crane.

V is a four-way valve which, in the old position, admits air to both ends of the cylinder *R*, thus holding the crane stationary. Turning the lever in one direction opens the exhaust on one end, and the pressure remaining on the other end, the crane rotates in the direction in which the lever was moved. Obviously, the reverse movement of the valve rotates the crane in the other diection.

This crane has been in operation for about five months loading and unloading wheels, axles and other heavy material. The rotative device may be applied to turntables or other similar apparatus.

Sanding Engines.

Fig. 8 illustrates a method of sanding-engines by the use of compressed air, which has been in operation at Kansas City for two years. The large cylinder is filled with dry sand through the opening shown at the top. This opening is then hermetically closed and compressed air forces the sand to an elevated storage tank, as shown by the arrows. A heater is provided for drying the sand and heating the air in cold weather.

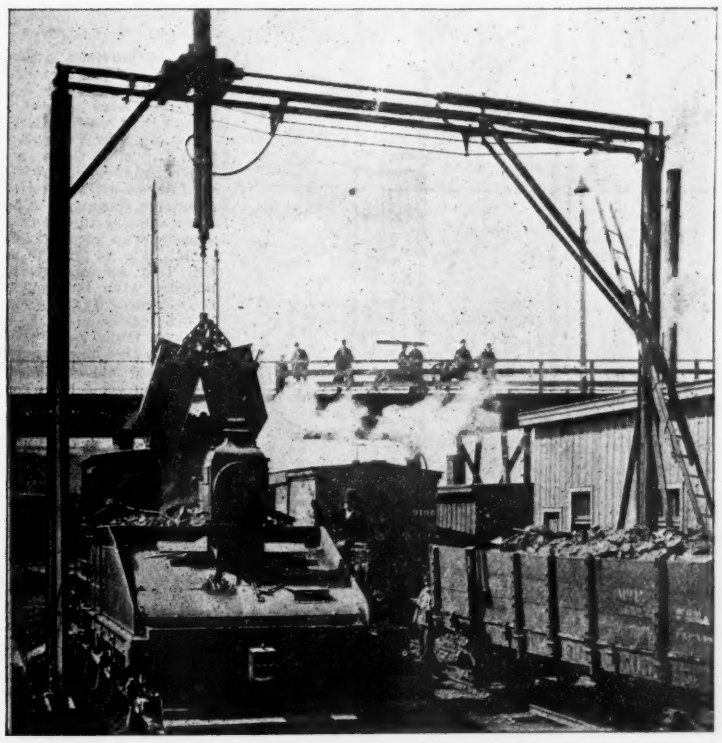


Fig. 6.—Coaling Device in Operation.

Train Accidents in the United States in August.

COLLISIONS.

REAR.

4th, on Chicago & Alton, near Mexico, Mo., a stock train, which had been suddenly stopped by the automatic application of the air-brakes, was run into at the rear by a following stock train, wrecking engine, caboose and several cars of livestock. One tramp was killed and another injured.

11th, on Chicago & Grand Trunk, near Haslett Park, Mich., a freight train broke in two and the rear portion afterward ran into the forward one, wrecking 10 cars. One tramp killed and another injured.

14th, on Erie Road, at Port Jervis, N. Y., a freight train standing in the yard was run into in the rear by a following freight, wrecking one car. One brakeman injured.

16th, 1 a. m., on Georgia Railroad, near Covington, Ga., a passenger train ran over a misplaced switch and into a car of coal standing on the side track. The engineman was injured.

18th, on Chicago & Alton, near Sag Bridge, Ill., a freight train broke in two and the rear portion afterward ran into the forward one, wrecking two cars. In one of them were two tramps, one of whom was killed and the other injured.

24th, on Pittsburgh & Western, at Valencia, Pa., a westbound freight train ran into the rear of a preceding freight, standing at the station, making a considerable wreck, which fouled the eastbound track directly in front of passenger train No. 14; the latter was running at high speed and the engine and first two or three cars

were not derailed; but some large iron tubes in the freight train penetrated the second passenger car, wrecking the upper part of it and injuring thirty passengers. Four trainmen were injured.

24th, on Chicago & Grand Trunk, near Lansing, Mich., a freight train, descending a grade, broke in two and the rear portion afterward ran into the former one, wrecking nine cars. A man stealing a ride was killed.

And 12 others on 10 roads, involving 5 passenger and 12 freight and other trains.

BUTTING.

1st, 2 a. m., on Louisville & Nashville, at Mountain Creek, Ala., butting collision of freight trains, wrecking both engines and several cars. One employee and one tramp were killed. It is said that an order given to one of the trains was misread.

1st, 8 a. m., on Illinois Central, near Birkbeck, Ill., butting collision of passenger trains, both running at considerable speed, making a bad wreck. The engineman, mail agent and express messenger were killed, and 5 passengers and trainmen hurt. The conductor and engineman of the northbound train overlooked a meeting order.

3d, on St. Louis, Iron Mountain & Southern, near Hematite, Mo., butting collision of freight trains, wrecking both engines and 17 cars. One of the conductors was injured.

3d, on Atchison, Topeka & Santa Fe, near Bosworth, Mo., butting collision of passenger trains 1 and 18; one engineman killed and 4 passengers and four trainmen injured. Train No. 1 had been ordered to wait for No. 18 at Dean Lake, but neglected to do so. The collision occurred on a trestle 60 ft. high, and both engines fell to the ground below. All of the injured persons were in the express car of No. 1, which was driven partly through the smoking car.

3d, on Wabash road, near Adrian, Mich, butting collision between an engine and a caboose running east and an engine and 40 platform cars running west, wrecking both engines and 18 cars. It is said that there was a mistake in issuing telegraphic orders.

12th, 1 a. m., on Southern Railway, at Amherst C. H., Va., a southbound freight train, approaching at uncontrollable speed, ran into a northbound freight standing at the station, making considerable wreck. One engineman injured.

15th, 3 a. m., on Baltimore & Ohio Southwestern, at Torch Hill, O., butting collision between a westbound passenger and an eastbound freight train, damaging several freight cars and the postal car. Both enginemen, one fireman and one brakeman were killed and two other trainmen were injured. It is said that the freight disregarded a telegraphic order.

18th, on Union Pacific, at Cache Junction, Utah, butting collision between a passenger train and a freight, at a meeting point, the passenger train approaching at uncontrollable speed. Both engines and two baggage cars were damaged. One express messenger was injured and a squaw stealing a ride was killed; another Indian was injured.

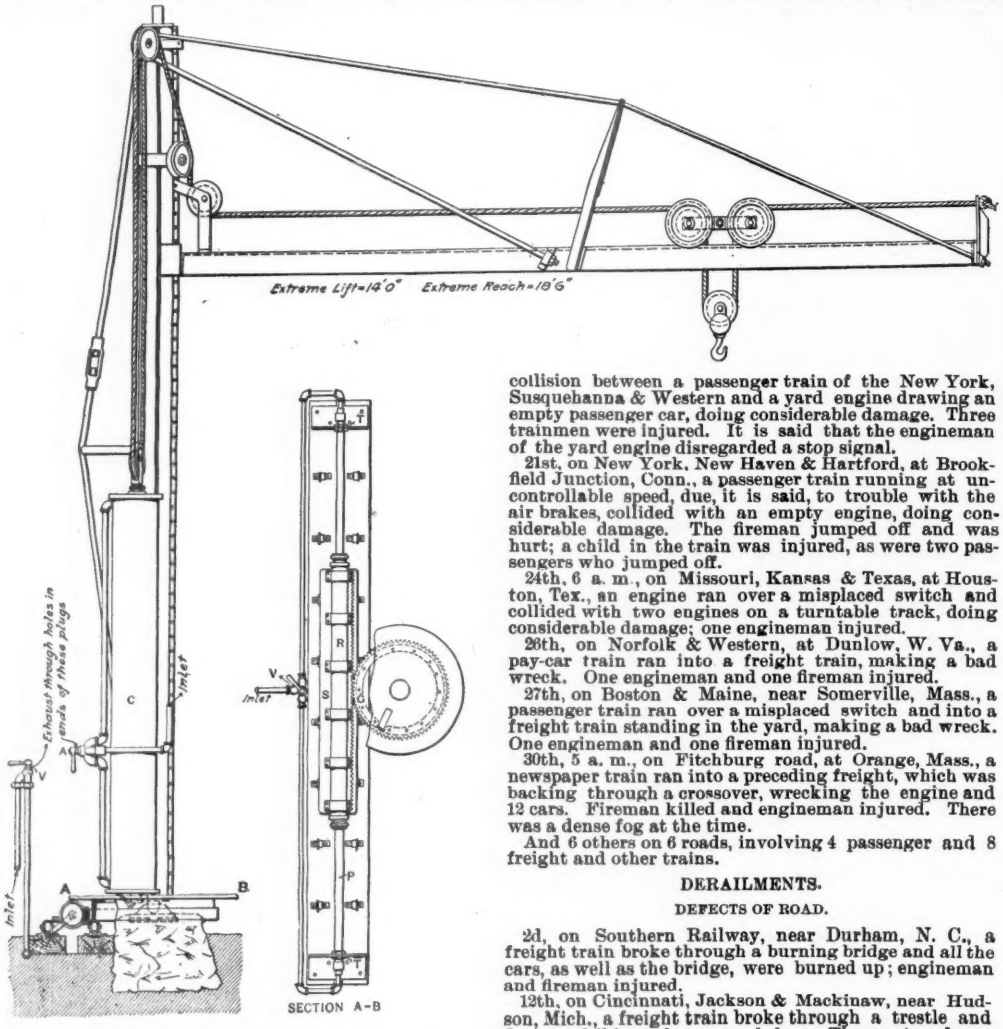


Fig. 7.—Four-ton Crane, Operated by Compressed Air—Missouri Pacific Shops.

20th, on Detroit, Lansing & Northern, near Fowlerville, Mich., butting collision of passenger trains, wrecking both engines. One fireman injured.

26th, on Mobile & Ohio, near Mobile, Ala., a freight train ran over a misplaced switch and into a switching engine standing on the side track, making a bad wreck. Three employees injured.

29th, on Union Pacific, near Pynchon, Wyo., butting collision between a freight and an empty engine, making a bad wreck. One engineman was injured.

31st, on Norfolk & Western, at Ramsey, Va., 12 freight cars, which had escaped control in a yard and were running down hill at considerable speed, collided with a freight train, making a bad wreck, most of which was burned up. Five trainmen were injured, two of them fatally.

31st, on Erie & Pittsburgh, near Springboro, Pa., butting collision between a passenger train and an empty engine, both running at high speed. Both engines were badly damaged. One fireman was killed and 1 other trainman and 3 passengers were injured.

And 2 others (freight trains).

CROSSING AND MISCELLANEOUS.

10th, 9 p. m., on Toledo & Ohio Central, at Columbus, O., a passenger train collided with a switching freight train in the yard, and both engines and one baggage car were derailed. Both enginemen were killed and three other trainmen were injured, two of them fatally. It is said that there was an error in issuing telegraphic orders.

14th, at Ground House, Minn., a freight train of the Eastern Minnesota collided with an engine of the Great Northern, making a bad wreck. The Great Northern fireman was killed.

14th, on Pennsylvania road, at Jersey City, N. J., collision between a passenger train of the New York, Susquehanna & Western and a yard engine drawing an empty passenger car, doing considerable damage. Three trainmen were injured. It is said that the engineman of the yard engine disregarded a stop signal.

21st, on New York, New Haven & Hartford, at Brookfield Junction, Conn., a passenger train running at uncontrollable speed, due, it is said, to trouble with the air brakes, collided with an empty engine, doing considerable damage. The fireman jumped off and was hurt; a child in the train was injured, as were two passengers who jumped off.

24th, 6 a. m., on Missouri, Kansas & Texas, at Houston, Tex., an engine ran over a misplaced switch and collided with two engines on a turntable track, doing considerable damage; one engineman injured.

26th, on Norfolk & Western, at Dunlow, W. Va., a pay-car train ran into a freight train, making a bad wreck. One engineman and one fireman injured.

27th, on Boston & Maine, near Somerville, Mass., a passenger train ran over a misplaced switch and into a freight train standing in the yard, making a bad wreck. One engineman and one fireman injured.

30th, 5 a. m., on Fitchburg road, at Orange, Mass., a newspaper train ran into a preceding freight, which was backing through a crossover, wrecking the engine and 12 cars. Fireman killed and engineman injured. There was a dense fog at the time.

And 6 others on 6 roads, involving 4 passenger and 8 freight and other trains.

DERAILMENTS.

DEFECTS OF ROAD.

2d, on Southern Railway, near Durham, N. C., a freight train broke through a burning bridge and all the cars, as well as the bridge, were burned up; engineman and fireman injured.

12th, on Cincinnati, Jackson & Mackinaw, near Hudson, Mich., a freight train broke through a trestle and five cars fell into the water below. The engine drawing the train was much heavier than those usually used on this division and this was its first trip over this bridge.

And 3 others on 3 roads, involving 1 passenger train and 2 freight trains.

DEFECTS OF EQUIPMENT.

3d, on Cleveland, Cincinnati, Chicago & St. Louis, at North Indianapolis, Ind., a car in a freight train, loaded with valuable horses, was derailed and ditched. Four horsemen were injured. It is said that the derailment was due to a broken journal.

7th, on Chicago, Rock Island & Pacific, at Leighton, Ia., a freight train was derailed by a broken axle and 9 cars of live stock and fresh meat were ditched. Five tramps, riding on a car loaded with sheep, were killed.

9th, on Cleveland, Cincinnati, Chicago & St. Louis, near Grafton, O., a freight train was derailed by the breaking of a journal and three cars of live stock were wrecked. Ten tramps were injured, two fatally.

14th, on Louisville & Nashville, near Morris, Ky., the caboose of a freight train was derailed by a broken drawbar which had fallen upon the track, and fell down a bank. A brakeman was killed and another fatally injured.

20th, on Baltimore & Ohio Southwestern, at Madisonville, O., an eastbound freight train was derailed by a drawbar, which was pulled out and fell upon the track, and two cars fouled the westbound track immediately in front of a freight train. The fireman of the latter train was killed and six of its cars were wrecked.

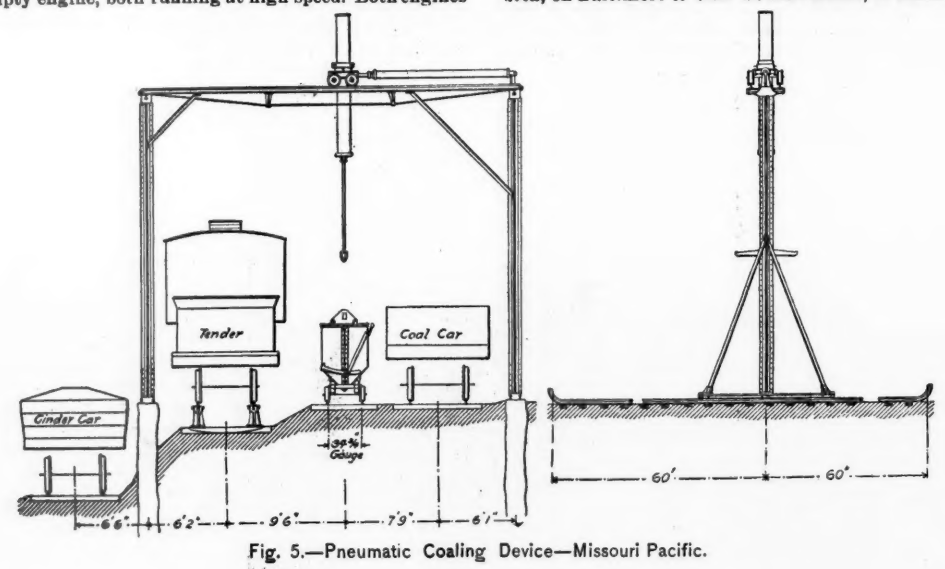


Fig. 5.—Pneumatic Coaling Device—Missouri Pacific.

21st, 11 p. m., on Grand Rapids & Indiana, near Milton Junction, Mich., a freight train was derailed by the breaking of a car, and seven cars were wrecked; three tramps injured.

25th, on Cleveland, Cincinnati, Chicago & St. Louis, near Houston, O., a freight train was derailed by a broken axle and 15 cars were wrecked. Two tramps badly injured.

30th, on Manitou & Pike's Peak (rack railroad), near Manitou, Col., the engine of a passenger train descending the mountain became uncontrollable by reason of the breakage of a connecting rod and ran off the track and was wrecked. The engine attained high speed before being derailed, and after tumbling some distance down the mountain its boiler exploded. The car, which was above the engine, was stopped in safety, and the engineman and fireman jumped off in season to save themselves. A boy standing near the place where the wreck lodged was injured.

And 9 others on 9 roads, involving 1 passenger train and 8 freight and other trains.

NEGLIGENCE IN OPERATING.

11th, 10 p. m., on Chicago, Milwaukee & St. Paul, near Milwaukee, Wis., a stock train was derailed by a misplaced switch and the engine fell into the ditch. The conductor, who was riding on the engine, acting as pilot, was killed.

UNFORESEEN OBSTRUCTIONS.

4th, on Philadelphia & Reading, near Shamokin, Pa., freight train No. 55, running at high speed, was derailed by a freight car door which had fallen upon the track, and the engine and 12 cars were wrecked. The wreck took fire and was destroyed; a car of powder standing on a siding near by exploded soon after the wreck. The engineman was killed and his body burned up, and the conductor was also killed. The fireman was fatally injured.

6th, Burlington & Missouri River, near Clearmont, Wy., a passenger train was derailed by running over a steer and all of the cars were ditched. The engineman and fireman were injured and several passengers slightly hurt.

8th, on New England road, at Waterbury, Conn., the engine of a freight train was derailed by sand which had been washed upon the track and was overturned. Engineman injured.

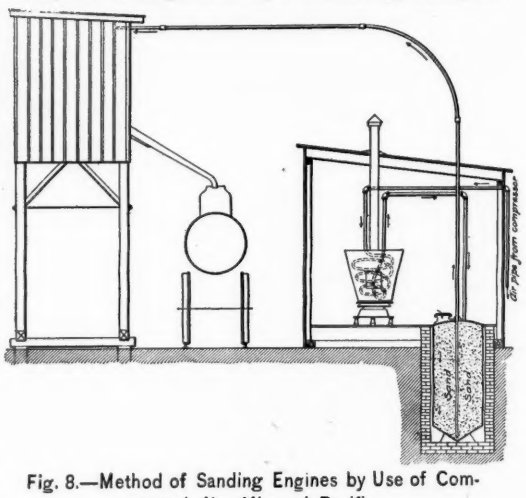


Fig. 8.—Method of Sanding Engines by Use of Compressed Air—Missouri Pacific.

13th, 4 a. m., on Lake Shore & Michigan Southern, near Otis, Ind., a passenger train was derailed at a culvert which was weakened by a freshet; the engine was ditched and all of the cars derailed. The engineman and fireman were killed and several passengers were slightly injured.

19th, on Cleveland, Canton & Southern, near Carrollton, O., the engine of a work train was derailed and overturned and the engineman and fireman killed. It is said that the derailment was due to spikes lying upon the rail at the outside of a curve, probably placed there by children.

22d, on Northern Pacific, near Horse Plains, Mont., a freight train was derailed by a landslide in a high embankment and four employees were killed.

23d, 1 a. m., on Ohio Southern, near Springfield, O.,

a freight train was derailed by a fallen tree and the engine and 13 loaded cars were wrecked. Fireman badly injured.

And 4 others on 4 roads, involving 1 passenger train and 3 freight and other trains.

UNEXPLAINED.

1st, on Baltimore & Ohio, at Morgan, Md., a freight train was derailed and a drover was killed.

4th, on Chicago, Burlington & Quincy, near Chadwick, Ill., a freight train was derailed, killing one brakeman. Two other trainmen were injured, one fatally.

9th, on Missouri, Kansas & Texas, near Taylor, Tex., a freight train was derailed and 12 cars were ditched. One brakeman injured.

15th, on Denver & Rio Grande, near Vegas, Colo., a passenger train was derailed and some of the cars were ditched. The engineman and fireman were killed.

19th, 5 a. m., on Chicago, Rock Island & Pacific, near Topeka, Kan., a stock train was derailed. Four tramps riding in a feed box attached to the bottom of one of the cars were killed.

26th, 9 p. m., on New York Central & Hudson River, at Schenectady, N. Y., a freight train was derailed, ditching several cars and wrecking a signal tower. The signal man was thrown to the ground. A man stealing a ride was injured.

27th, on Boston & Maine, at Concord, N. H., a passenger train was derailed and 15 passengers injured.

And 13 others on 13 roads, involving 2 passenger and 11 freight and other trains.

OTHER ACCIDENTS.

One breakage of parallel rod and one failure of axle, both passenger trains.

A summary will be found in another column.

The Present Status of the Compound Locomotive in France.—IV.

BY M. MAURICE DEMOULIN, *Engineer Western Railroad of France.*

(*Continued from page 538.*)

This new type, which is shown in Figs. 16 and 17, is a modification of engines 3,201 and 3,202 that were built in 1888, and referred to the second part of this series of articles, June 5. Like all the other compound locomotives on the Paris, Lyons & Mediterranean, they are of the four-cylinder type, driving two different axles that are, however, coupled together as well as to the two remaining axles with side-rods. The high-pressure cylinders are between the frames and the low-pressure cylinders on the outside. The four valve-motions are of the Walschaert system, and are controlled by a steam-reversing gear with cams like that used on the express locomotives. A special cock enables the engineer to admit live steam into the receiver for starting, the pressure being limited to 100 lbs. per square inch by a safety valve.

The boilers are similar to those used on the express locomotives of 1892; they have the Serve tubes, a very short barrel and a very long smokebox. The tubes have a length of 9 ft. 10.11 in. instead of 14 ft. 2.2 in. as in the first type, the diameter of the barrel remaining the same. The boiler being more powerful, the diameter of the cylinders could be increased proportionally. Yet, on account of the use of the Serve tubes, the weight has dropped from 56.9 to 53.7 gross tons in working order.

Engines 3,201 and 3,202 have been used in some very carefully conducted trials, under conditions that insured as great an accuracy in the results as it is possible to attain and in comparison with engines 3,108 and 3,110 that were of nearly the same design, but not compound. On comparing among other things the coal consumption per ton-mile, it was found that the compound locomotives had, during a period of seven months, effected a saving of 13 per cent. in trials 1, 2, 3 and 4, and 15 per cent. in trials 5, 6, 7 and 8, that is, an average of 14 per cent. saving over the simple engine No. 3,108. The saving was only 8 per cent. over the simple engine No. 3,110. The average saving as a whole thus becomes 11 per cent.

Regarding the engines of the last type, Nos. 3,211 to 3,300, the coal consumption reported for actual service enables us to form an accurate idea of the saving relatively to the simple engines Nos. 3,001 to 3,140. The benefits derived have varied greatly according to the conditions predominating on the different divisions, as shown by the following statement:

Saving Effected by the Compound Locomotives.

At the depot of	Villeneuve St. Georges	11.83 per cent.
" "	Dijon-Perrigny	14.71 "
" "	Lyons-Mouche	30.94 "
Average		19.16 "

The saving shown at Villeneuve St. Georges and at Dijon-Perrigny may be considered to be about normal; while that reported on the Lyons-Mouche Division seem to be excessive and can probably be attributed to the likelihood of the full power of the simple engines Nos. 3,001 to 3,140 not being utilized for a considerable period.

We give below the principal dimensions of the different types of compound locomotives that have been successively put into service on the Paris, Lyons & Mediterranean.

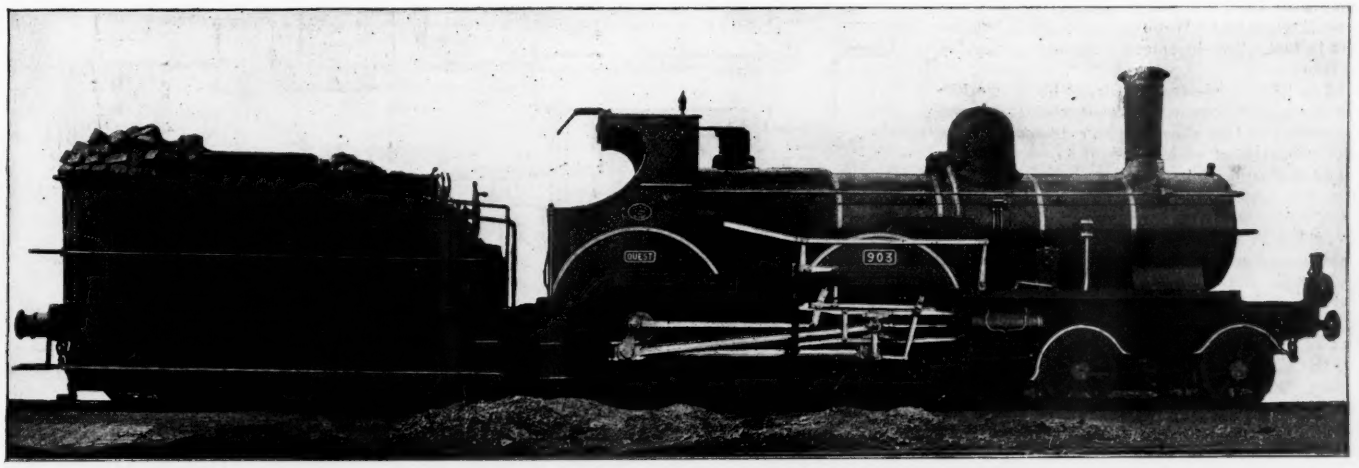


Fig. 18.—Compound Locomotive, 1894—Western Railroad of France.

PRINCIPAL DIMENSIONS OF THE COMPOUND LOCOMOTIVES IN SERVICE ON THE PARIS, LYONS & MEDITERRANEAN RAILROAD.

	Express, 1888.	Freight, 1888.	Pushers or grade, 1888.	Express, 1892.	Freight, 1893.
Length of grate	7 ft. 7.22 in.	7 ft. 7.61 in.	7 ft. 1.4 in.	7 ft. 4 in.	7 ft. 11.12 in.
Grate area	25.19 sq. ft.	14.75 sq. ft.	23.46 sq. ft.	24.98 sq. ft.	26.48 sq. ft.
Kind of tubes	Ordinary.	Ordinary.	Ordinary.	Serve.	Serve.
Number of tubes	185	247	247	133	139
Diameter of tubes, outside	1.97 in.	1.97 in.	1.97 in.	2.56 in.	2.56 in.
Length of tubes between tube sheets	13 ft. 2.86 in.	14 ft. 3.26 in.	13 ft. 7.39 in.	9 ft. 10.11 in.	9 ft. 10.11 in.
Heating surface in firebox	125.98 sq. ft.	112.68 sq. ft.	118 sq. ft.	112.14 sq. ft.	105.38 sq. ft.
" " " tubes	1,161 sq. ft.	1,488.44 sq. ft.	1,579.3 sq. ft.	1,482.39 sq. ft.	1,554.97 sq. ft.
" " total	1,286.08 sq. ft.	1,601.12 sq. ft.	1,697.3 sq. ft.	1,594.53 sq. ft.	1,660.35 sq. ft.
Diameter of shell	49.78 in.	55.12 in.	59 in.	51.97 in.	55.12 in.
Thickness of metal in shell	0.55 in.	0.59 in.	0.63 in.	0.57 in.	0.59 in.
Steam pressure	213 lbs.	213 lbs.	213 lbs.	213 lbs.	213 lbs.
Total wheel base	19 ft. 2.7 in.	18 ft. 9.6 in.	13 ft. 3.45 in.	22 ft. 7.66 in.	18 ft. 10.4 in.
Diameter of driving wheels	7 ft. 2.6 in.	4 ft. 11 in.	4 ft. 1.78 in.	7 ft. 2.6 in.	4 ft. 11 in.
" " truck "	4 ft. 3.18 in.	.....	.....	3 ft. 3.37 in.	.....
Number of cylinders	4	4	4	4	4
Diameter of H.-P. cylinders	12.21 in.	13.37 in.	14.17 in.	13.37 in.	14.17 in.
" " L.-P. "	19.68 in.	21.26 in.	21.26 in.	21.26 in.	23.23 in.
Stroke of pistons	24.41 in.	25.59 in.	25.59 in.	24.41 in.	25.59 in.
Ratio of cylinder volumes	.....	.....	.....	2.53	2.69
Maximum travel of H.-P. valves	4.57 in.	5.39 in.	5.55 in.	4.82 in.	5.39 in.
" " L.-P. "	5.59 in.	5.63 in.	5.63 in.	6.14 in.	5.63 in.
Outside lap of H.-P. valves	1.10 in.	1.10 in.	1.14 in.	1 02 in.	1.10 in.
" " L.-P. "	1.06 in.	1.14 in.	1.14 in.	1.34 in.	1.14 in.
Maximum admission H.-P. cylinders	71.5 per cent.	77 per cent.	78 per cent.	72.5 per cent.	77 per cent.
" " L.-P. "	84 5 per cent.	78 per cent.	80 per cent.	75 per cent.	78 per cent.
Total weight empty	109,142 lbs.	113,955 lbs.	113,800 lbs.	98,475 lbs.	119,958 lbs.
Total weight in working order: First axle	29,552 lbs.	30,323 lbs.	28,868 lbs.	21,164 lbs.	30,037 lbs.
Second "	32,634 lbs.	30,411 lbs.	30,323 lbs.	21,164 lbs.	30,037 lbs.
Third "	32,634 lbs.	32,215 lbs.	35,252 lbs.	33,378 lbs.	29,177 lbs.
Fourth "	23,150 lbs.	32,523 lbs.	32,126 lbs.	33,092 lbs.	29,177 lbs.
Total	117,970 lbs.	125,472 lbs.	126,569 lbs.	108,798 lbs.	118,428 lbs.

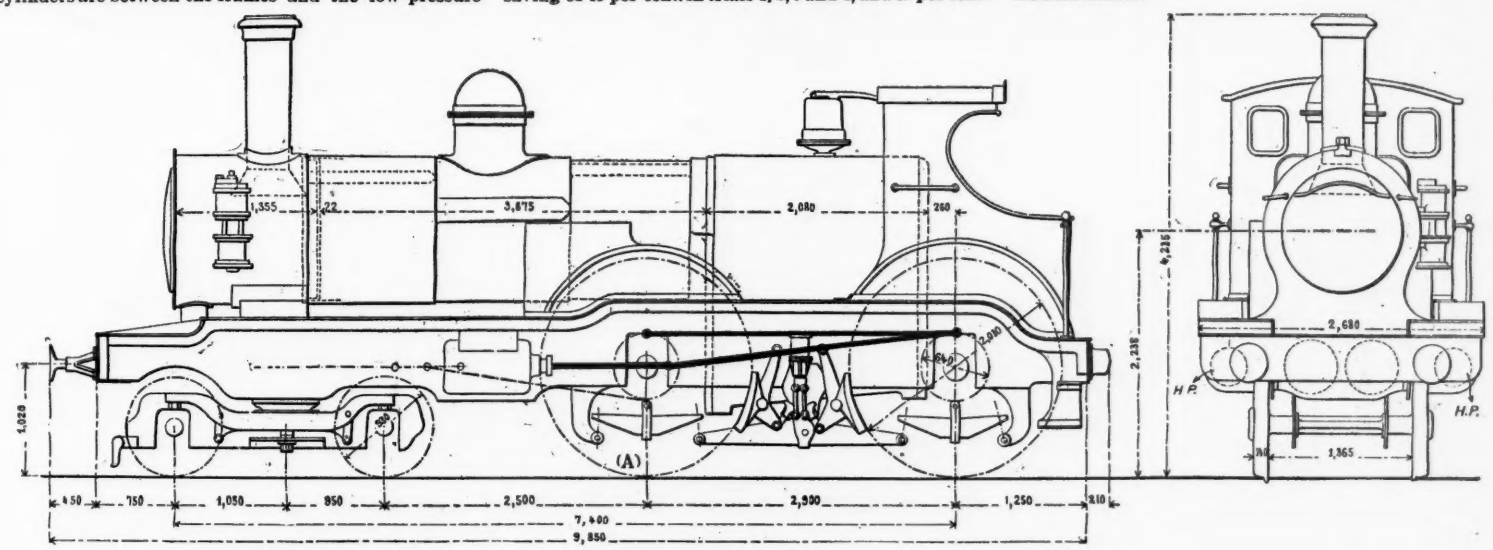


Fig. 19.—Four-Cylinder Compound Locomotive, 1894—Western Railroad of France.

In resumé, the Paris, Lyons & Mediterranean Railway Co. now owns compound locomotives as follows:

Two eight-wheeled express locomotives, with four wheels coupled, C 1 and C 2 of the type of 1888.

Two eight-wheeled coupled locomotives for fast freight, Nos. 3,201 and 3,202 of the type of 1888 (page 392).

Two locomotives with eight wheels coupled for heavy grades, Nos. 4,301 and 4,302 of the type of 1888 (page 392)

Three express locomotives with bogie trucks of the type of 1892.

Forty express locomotives with bogie trucks of the type of 1894.*

One hundred and fifty-four fast freight locomotives of the type of 1893.

Ten fast freight locomotives transformed in 1893;

Or in all 213 four-cylinder compound locomotives.

THE WESTERN RAILROAD.

The Western Railroad was the first of the great railway companies of France to put compound locomotives into service; it was a small Webb engine that was bought in England in 1884. This locomotive has been in service since that time.

From 1884 to 1894 the Western Railroad built no other compound locomotive, but in the latter year it ordered two locomotives, like that shown in Figs. 18 and 19, from the *Société Alsacienne*, which only differed from the latest type of engines with bogie trucks belonging to the company in the application of the compound principle with four cylinders and the raising of the steam pressure from 156 lbs. to 200 lbs. per square inch. These engines were designed and constructed under the immediate supervision of M. C. Crault, Superintendent of Motive Power and Equipment, and they are quite powerful, though of a moderate weight. The general arrangement of the mechanism is similar to that of the engines of the Northern and Southern companies described above. The reversing gear has also been modified and simplified so that there is every facility for maintaining the independence of each valve motion. Two screws have been placed end to end, one for each reach rod. The screw next to the handwheel is hollow, allowing a rod, which is a prolongation of the other screw, to pass through it. Gears are keyed upon each screw, which can be made to mesh separately or at the same time with the handwheel. This handwheel is fitted with a pawl operated by a single movable handle by which it can be made to stand in any one of three positions. In the horizontal position the two screws are fastened solidly to the wheel and the two sets of valves are operated at the same time. When the handle is raised, the screw at the front is set free and the engineer works the valve motion for the low-pressure cylinders without making any change in the position of the other screw. When the handle is lowered the back screw is worked alone. By means of this apparatus, it is possible for the engineer to vary the relative points of cut-off in the two sets of cylinders, and he can especially increase the time of admission in the low-pressure cylinders, a practice that is acknowledged to be advantageous at certain times.

The following is a list of the principal dimensions of these locomotives:

Diameter of H. P. cylinders	12.60 in.
" " L. P. "	19.68 in.
Stroke of pistons	25.20 in.
Steam pressure	200 lbs.
Diameter of driving wheels	6 ft. 8.31 in.
Total wheel base	24 ft. 3.34 in.
Grate area	21.53 sq. ft.
Heating surface	1,527 41 sq. ft.
Total weight, empty	95,702 lbs.
" " in working order	104,953 lbs.

At the end of 1895, the Western Railway Co. ordered two three-cylinder compound locomotives, as shown in Fig. 20, from the Creusot works. These were much more powerful than the preceding ones, having six wheels coupled with a bogie truck; the driving wheels have a diameter of 5 ft. 3 in., the heating surface is 1,923.52 sq. ft.; the grate area is 28 sq. ft., and the total weight in working order is about 132,300 lbs. At the same time they ordered two other locomotives exactly similar to these, but having two cylinders working single expansion, so that they will be able to make a comparison and show the relative value of the two systems.

Finally the branch lines in Brittany, where the gage

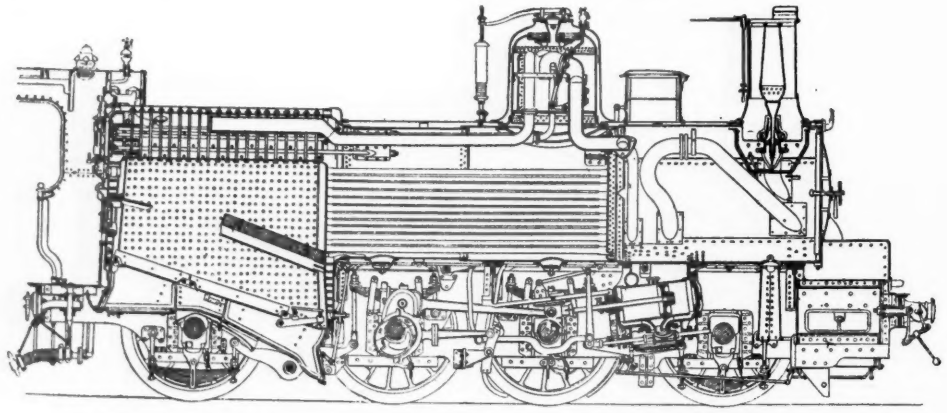


Fig. 17.—Compound Locomotives, Nos 3211-3300—Paris, Lyons & Mediterranean Railroad.

is one meter (3 ft. 3.37 in.) the company uses articulated locomotives of the Mallet type, of which we will speak in another place.

THE STATE RAILROAD.

At the present time the state railroads own but one compound locomotive and this was changed for a simple one in 1888. It is of the ordinary Mallet two-cylinder type for freight service with six wheels coupled. The high-pressure cylinder has the same dimensions as before the change, namely, a diameter of 16 54 in. and a stroke of 23.62 in. The diameter of the low-pressure cylinder is 23 62 in., with the same stroke, which gives a ratio of volumes of one to two.

This machine, which is illustrated by Fig. 27, has a starting valve of the Mallet type. The reversing gear is so arranged as to permit making a smaller reduction in the travel of the low-pressure valve than is done with that of the high pressure.

No other locomotive has been built for the State Railroad since attempts are being made to effect a saving by the application of a cut-off to single-expansion cylinders.

[TO BE CONCLUDED.]

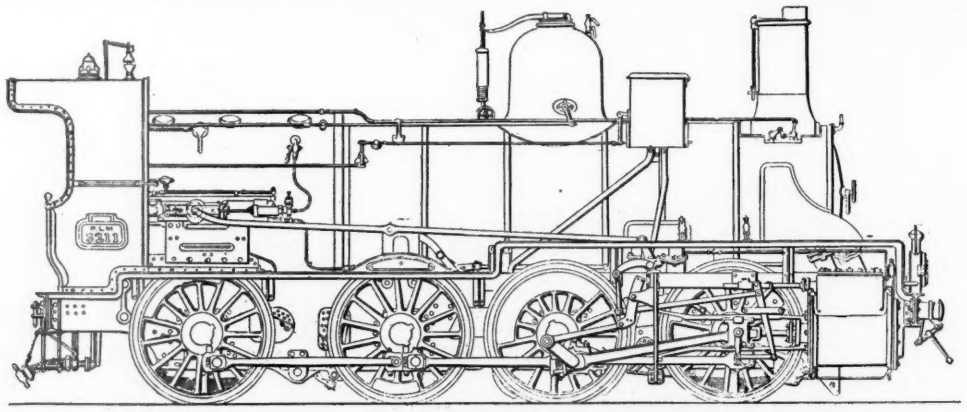


Fig. 16.- Compound Locomotives, Nos. 3211-3300—Paris, Lyons & Mediterranean Railroad.

Is the Switch and Lock Movement Safe ?*

To many this title may seem somewhat surprising, in view of the fact that almost every railroad is using switch and lock movements, and that the signal companies install them, unless stated in the specifications that facing point locks shall be used. If the switch and lock movement is unsafe why do the roads allow any to remain in service, and why do signal companies countenance their use ? If they are safe why go to an additional expense of about 25 per cent. of the cost of a plant for the sake of using a facing point lock, not to speak of the additional cost of repairs, or the time lost in the operation of the plant moving additional levers ? Does the facing point lock entirely overcome the objections to be made against the switch and lock movement, and are there no weak points in its design ? If so, what is to be recommended as the best practice ? Upon signal engineers is laid the responsibility for the design and maintenance of these safety appliances, and if they are not safe, it is time that the signal engineers should say so, in order that this responsibility may be placed with their superior officers.

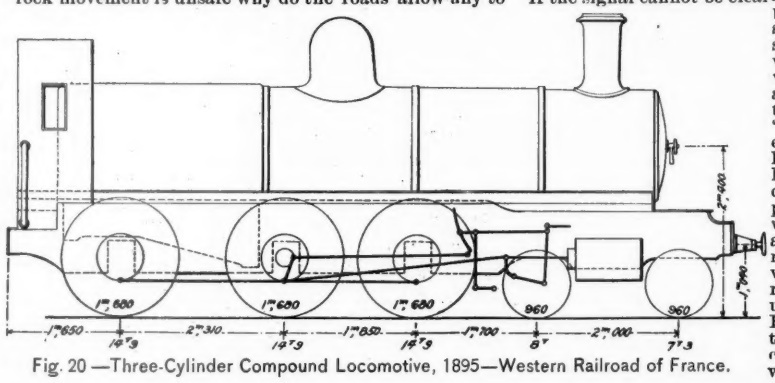


Fig. 20 —Three-Cylinder Compound Locomotive, 1895—Western Railroad of France.

The weak point in the design of the switch and lock movement is the short travel of the driving bar which is available for locking the switch or point after the movement of the switch has been made. With a total motion of 8⅜ in. of the driving bar, but 2¼ in. at each end of the stroke can thus be utilized, the remainder, or 4½ in., being used to turn the switch crank and with it the points of the switch. If, now, with a maximum locking travel of 2¼ in. the switch or point should be blocked and fail to close, as might easily happen through snow, ice or any solid substance getting in between the point and the stock rail, the plunger would strike on the lock bar, and if the connections were long or not in good condition, the lever could be pulled over, freeing the signal lever, and the switch would not be locked. More especially would this be likely to happen if two movements were placed on one lever when at any great distance from the tower, for not only is the power required for the two movements so close to the limit of what the connections will stand that the wear is very great, but the strain is such that it is hard for the operator to tell whether the plunger has entered the hole in the lock-bar and locked the switch or not. Of course where the connections are short and consequently stiffer, it is much more difficult to spring the pipe the 2¼ in. necessary. With this weak point about the movement, it is to be wondered at that any of them are to be found in use, and were it not for the protection afforded by the bolt lock, there can hardly be any doubt that they would all be taken out.

The bolt lock, however, is the key to the situation, for it puts a check upon the movement of the signal which no amount of plunger locking can give, and, at the same time, takes no additional power to work it, and is of simple construction. No matter how loose the connections may be, or how much the lever may have been pulled over, springing the pipe lines, unless the point has actually closed, the slot in the bolt lock has not come to its proper place and the signal cannot be cleared. If the signal cannot be cleared unless the point has been properly closed, safety is secured. Considering the switch and lock movement, when used in connection with the bolt lock, as being a reasonably safe appliance, the question might be asked, "What necessity is there for employing a facing point lock with the additional lever to pull and the extra cost ?" To anyone not well posted on signal matters it would seem that convincing answers to these questions might be easily made, in view of the fact that several roads specify or favor the use of facing point locks. But if there is reason for this the fact has not been made clear to several of us who would like to be enlightened.

With the facing point lock, the plunger has a travel of from 5 to 6 in. through the lock rod, so that should the switch fail to close, it would be practically impossible to get the lever over by springing the connections, and, of course, the signal could not be cleared. This, at first sight, would appear as a much safer appliance than the switch and lock movement, but in reality it is but little better, for if the connections to the switch should be broken or become disconnected in any way, and it is a fact that they do break occasionally, the plunger might enter the same hole in the lock-bar and lock the switch in the old position, allowing the signal to be cleared with the switch not changed. To guard against any such accident as this, a bolt lock must be used, and we are then relying upon the same means for safety as when using a switch and lock movement. If the bolt block has to be depended upon to make the facing point lock safe, what need is there of the facing point lock when a switch and lock movement with one lever and one pipe line will answer ?

It might be said that it is not possible to bolt-lock every switch or derail with the signal governing the route, which is true enough, and under such circumstances the advisability of using a facing point lock is not to be questioned, but even then some device should be used which would, by means of a spring, throw the points sufficiently to prevent the plunger from entering the same hole in the lock-bar, should the connections fail in any way. Such a device was described by Mr. Miles in his paper read before the club in 1895.

When there are two switches to be connected which are 500 ft. or more from the tower, such, for instance, as a cross-over, where both could be operated by one lever, but where, owing to the power required to work them at that distance two levers are required, it is much the better plan to make use of facing point locks, for not only is the cost less, but the switches are easier worked and are much less likely to be run through and damaged.

To sum up, the points I have endeavored to make are that it is best to use a switch and lock movement wherever a bolt lock can be put on the signal connection. If the bolt lock cannot be used and a facing point lock is to be put in, some spring device should be used to move the points slightly in case the switch should not have been moved by the lever and that no two switch and lock movements should be put on the same lever where they are more than 500 ft. from the tower.

A Sliding Wing Frog.

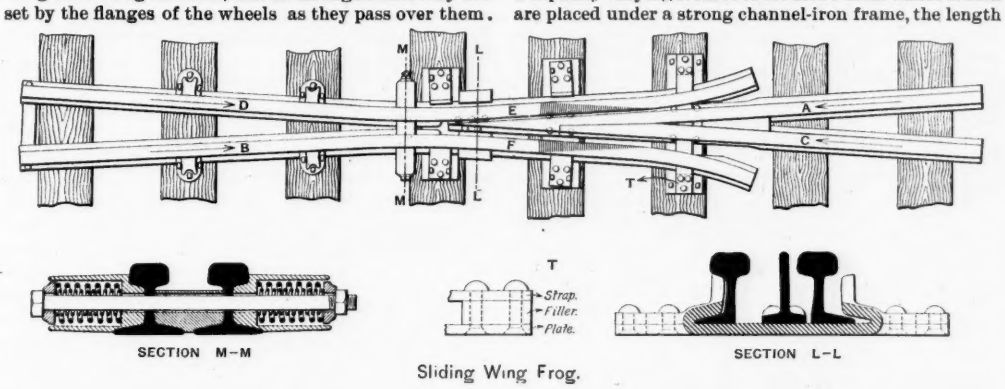
A sliding wing frog, of which a model was exhibited at the recent convention of the New England Road-Masters' Association, at Boston, has lately been put on the market. The frog is designed for use in yards, and the same advantages are claimed for it as for the spring

* The total weight of the express locomotives of 1894 is 111,320 lbs.

* Paper read before the Railway Signaling Club, Chicago, Sept. 22, 1896, by Mr. W. H. Elliott, C., M. & St. P. Ry.

rail frog on main lines; that it gives a continuous track, and thus reduces the hammering as the wheels pass from the wing rail on to the frog point, or *vice versa*, making a saving in rolling stock and greater comfort in traveling.

The working of this frog is entirely automatic, the wing rails being movable, and so arranged that they are set by the flanges of the wheels as they pass over them.



Sliding Wing Frog.

The frog point is stationary and is riveted to the plates which are spiked to the ties. Wrought iron braces are riveted to the tie plates and limit the throw of the wing rails. The plate directly under the point is cut and turned over, forming a stop and brace for the wing rails, as shown in section *L L*. The plate nearest the heel has riveted to it a strap which passes through slots in the wing and point rails, and thus prevents the wings from rising. A side view of this holding-down strap is shown in the drawing *T*. A plate is fastened by countersunk rivets to the throat end of the wing rails to prevent them from spreading. A shallow taper channel is planed on the head of the wing rails, to make a passage way for worn treads, and to prevent them from prying open the wing rails when trailing the point.

The wings are not rigidly connected, but are held together by means of springs, as shown, so that in case one wing was held open by an obstruction in the throat between it and the frog point, it would not interfere with the proper working of the frog or cause damage to any of its parts, as the wing rail on the opposite side would still be shifted against the tension of the spring by each succeeding wheel of the train, thus acting as an ordinary spring rail frog. Or should both wings be held open by obstructions, the action would be the same as in an ordinary rigid frog.

When traffic is in the direction of arrow *A*, trailing the frog point, with the wings set as shown in the illustration, the flange of the first car-wheel will strike the wing-rail *E*, moving both wing-rails in concert, and bringing wing-rail *F* against the point, thus making the track continuous. If the traffic is facing the point, in the direction of arrow *B*, as the first wheel nears the frog-point its flange forces wing *E* away from the frog-point, against the tension of the spring, thus making a passage-way for itself; while wing *F*, upon which the second wheel is now running, may remain stationary, owing to the weight of the car upon it; as soon, however, as the first truck has passed on to the frog-point, the tension of the spring will bring wing-rail *F* against the frog-point, and thus the throat is left open for the following wheels of the train.

After a train has passed in the direction of arrows *A* or *B*, leaving wing *F* against the point, should a train come in the direction of arrow *C*, the frog will be operated in the same way as for traffic in the direction of arrow *A*. Should a train come in the direction of arrow *D*, when wing-rail *F* is against the point, the operation of the frog will be the same as described for traffic in the direction of arrow *B*.

This frog, as before mentioned, is for yard service only; it is not intended, and is not suitable for use on main lines, or where high speeds are attained. It is manufactured by the Wharton Railroad Switch Co., Jenkintown, Pa., on patents of Mr. David F. Vaughan, of the Pennsylvania.

Electric Switching Locomotive.*

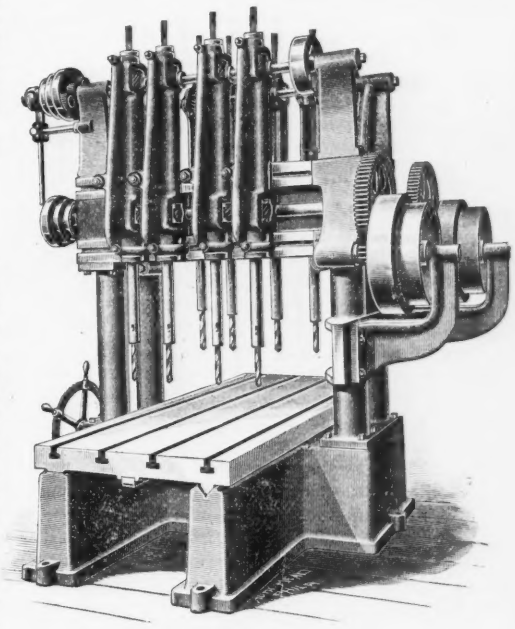
The larger switching locomotives built by the Baldwin Locomotive Works have the same fundamental features as the freight locomotive, viz.: two trucks, one under each end, each truck being fitted with two motors, with a capacity varying from 50 to 200 H. P. each. These trucks are placed under a strong channel-iron frame, the length of which is made as short as possible, but in all cases permitting the trucks to clear each other on curves. The four-wheel switchers have the motors and axles fixed in a frame, rigid with the cab.

The superstructure, or cab, is made long or short, according to circumstances. Usually the cab is short, and placed in the center of the locomotive, allowing a large space at each end, on which freight can be carried. These locomotives, when desired, have a crane at one end and a cab at the other. This crane is driven by an electric motor, and may have any required capacity. Switchers of this kind make excellent wrecking cars, and can be used in unloading freight.

One of the types of switching locomotives is shown by the accompanying cut.

Eight-Spindle Multiple Drilling Machine.

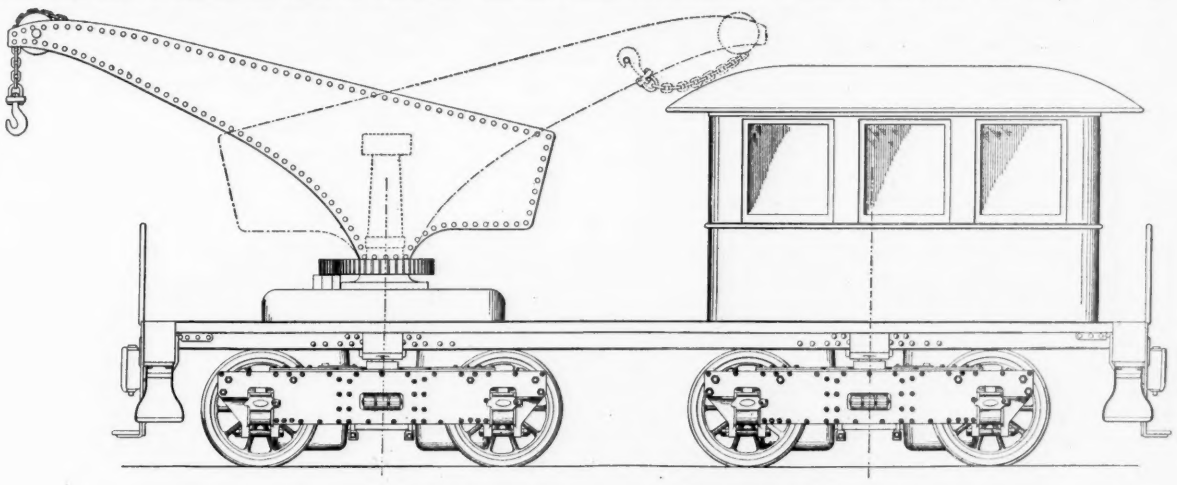
The engraving represents a special eight-spindle multiple drilling machine, made by the Newton Tool Works of Philadelphia, and designed for drilling the eight holes in the four boxes of an electric street-car motor at one time. Four spindles are on one rail and four on the opposite side. The spindles can be adjusted on the rail from five-inch centers, and the rails, while they are fixed on this machine, can be adjusted so as to give a greater distance from the centers of the two lines of the spindles. The four spindles on each rail are driven from an independent countershaft with an automatic feed and a power quick movement in both directions, moving four spindles up or down at the same time. The spindles are driven with spiral gearing, made of hardened steel and phosphor-bronze. When operating the machine for motor work, the motor frame is clamped to one end of the adjustable carriage. While the eight holes are being drilled at one time, another motor frame is being clamped to the opposite end of the carriage. When one frame is drilled, the power quick movement of spindles lifts all the spindles up out of the way. The carriage is adjusted by hand to bring the other motor frame in a position for drilling. This class of machines can also be adapted to other kinds of work.



Eight-Spindle Multiple Drilling Machine.

Incidental Benefits from Brown's Discipline.†

Whatever the system of discipline may be, it is essential that it should be carried out by absolute impartial



Eight-Wheel Switcher, with Electric Crane.

Built by the BALDWIN LOCOMOTIVE WORKS.

ity and that absence of favoritism should be patent to everyone. It is largely on this account that punishment by suspension has become unsatisfactory to most railroad officers, for it affects good employees as well as inferior employees. No matter how carefully and intelligently a worthy employee may perform his duties, he is liable to blunder, and in the same particulars that far less deserving men blunder. While strict justice might warrant his superior in overlooking in such an employee an offence that he would punish if committed by a persistently careless man, it would be difficult to reconcile the rank and file to such discriminations, as in many cases the reasons for discriminating would not be apparent to anyone but the officer in charge.

By doing away with suspensions, officers are enabled without imputation of favoritism to show careful and faithful employees the consideration they deserve. When a man who takes pride in his good work makes a mistake, his consciousness of it, the admonition he receives from his superior, and the entry of the occurrence on his record, surely satisfy the purposes of discipline. To add to these the mortification of a suspension, which lowers the employee's standing with his fellow-laborers, and, by depriving him of wages, causes his family to share his punishment, is unjustifiable severity.

But how about the man who is generally careless, who does not take pride in his work? It was on this very point that I was doubtful myself, and when the circular to Memphis employees, announcing the change of discipline was being prepared, I urged the insertion of the following clause: "Suspensions will be imposed when the head of the department deems disciplining by marks unsuitable to the case or to the individual." But with the experience I have since had, I am perfectly willing to surrender this reservation, believing now that suspensions are not necessary to effect proper discipline among even second-rate men. In fact, it is this class that seem to take the matter most seriously, evidently looking upon it as a scheme of their superiors to get rid of them. They, of course, regarded suspensions as an undesirable thing, but entertained the idea that having undergone a suspension, they were thereby purged of all guilt and entitled to a fresh start. They now realize that while they escape suspensions, the offences that were formerly punished in that way are treasured against them, and that eventually each offence, treated so indulgently at the time of its commission, will contribute in a measure to causing their dismissal. They discover that trivial offences, never considered sufficient to warrant suspension, are now recorded and are liable to prove the straw that breaks the camel's back.

Perhaps in no other particular is the advantage of the new system so pronounced as in the matter of disciplining for small irregularities, and as a result we observe a marked decrease in the number of slight, but vexatious, blunders.

All will recognize the advantage of keeping a small extra list that results from the abolition of suspensions, in consequence of which there are fewer accidents attributable to breaking in new men.

Another desirable feature is the opportunity afforded an officer to reverse or amend his ruling in particular cases, if, after the lapse of time, he finds that he has erred, or that evidence not obtainable at the time of the original investigation places the matter in a different light.

A usual accompaniment of disciplining by record is the posting of bulletins calling attention to the irregularities for which employees have been disciplined by record, and pointing out, if necessary, wherein they blundered. Too much stress cannot be laid on the good these bulletins do in the way of educating employees. Of course the name of the person at fault is not mentioned, but the men usually know from the description of the occurrence, its location, date, etc., who the man is.

The new system has been in operation on the Memphis road since Oct. 1, 1895, and all the officers of the Transportation Department, and a large majority of the employees, are gratified with the working of the new system and would be very much averse to returning to the old one.

* From the Baldwin-Westinghouse catalogue of Electric Locomotives.

† From a paper by H. S. Mitchell, Division Superintendent, Kansas City, Fort Scott & Memphis.

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.

Published Every Friday,

At 32 Park Place, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The dullness of the dull season is unusually intense this year, for obvious reasons; but even the universal depression of this unexampled period of world-wide stagnation is worse in some localities than in others and one of the worst of the worst must be Springfield, Mass., for the *Republican* of that city has printed two long editorials, with columns of stuff from a "special reporter," on the subject of baggage smashing. The great center of dull-season writing is London, where it usually takes the form of complaints of unpunctuality of trains, or discussions of the desirability of having 12 classes of passenger cars instead of the six now provided. Fresh subjects are so hard to find that the originality of the *Republican* ought to be welcome to the Englishmen; but we fear it will not, for they are so well provided over there with sole-leather trunks and portmanteaus, and the average size of their packages is so small, that the most vicious trunk-thrower has no terrors for them. We do not need to repeat the arguments presented by the *Republican*, for they are precisely the same ones that everybody has been familiar with for 25 years past. The baggageman drops trunks on their corners, and does it when there is no excuse for it, and the natural exasperation of the owner is of a character that nothing but cuss-words—or -thoughts, which are nearly as sinful—will suitably give vent to. The only remedy suggested is that the railroads know enough to do better and therefore, of course, ought to. This is rather vague. The true remedy is a well-backed lawsuit, repeated until effective. Get a good trunk, strong enough to bear hurried handling—passengers must admit that they demand quick work of the baggagemen and that light trunks will not stand this, when loaded with books and apples—and then insist on payment for every bit of damage it receives. Where, as in this case, a controversy depends upon the interpretation of the loose phrase "ordinary wear and tear," the only way to carry your point is to make it a prominent issue until a clear-cut opinion can be got from a court. If the railroads charge too much to wear-and-tear, let passengers combine to convince them that they are wrong. Perhaps the most significant thing in the *Republican's* report is its interview with a trunk manufacturer at Boston, who, having had his righteous soul vexed these many years by the dry-goods stores and other sellers of cheap "hat-shop trunks," strongly sustained the railroads in their assertion that half the trouble with trunks is their flimsy construction. This seems to have somewhat dampened the reporter's enthusiasm.

We have no desire to encourage the baggage-smasher, and we shall be glad to copy anything for his instruction that the *Republican* may print, provided it tells something beyond what is already well known; beyond the simple statement that trunks can and should be handled carefully and that time should be taken to do so; but so far, we think that one of the best things of the discussion is a letter printed in the *Republican* from a baggageman, deending himself. The letter says:

Who is to blame? An express train arrives, with only three minutes' stop, with from 60 to 70 pieces to unload, and as many more to load. There are 120 or 140 pieces to handle. The train must not be delayed on account of baggage, or there will be a letter from headquarters. The public will complain if the train is late. They wonder why the railroads do not make faster time. Ten or 20 parties will enter the baggage-room just 10 minutes of leaving time with baggage to check They must all be waited upon immediately. Some of their baggage is at the very bottom of the pile, and some on the other side of the station. A man must handle 10 or 12 trunks in as many seconds. People ask why the company do not put on more help? The company have about 10 minutes' notice of what passengers call busy time. Of course it looks hard to see a man let your trunk drop from a truck, but after a man has had his hand laid open from letting some lady's trunk, with nothing in it, down easy, he soon thinks his flesh and bone is of as much consequence as some trunk. Many a finger has been smashed and hand cut by those same trunks. A new man is sure to get hurt trying to be careful. If trunks were only packed with clothing, instead of books and everything else, there would be fewer broken. It is heavy articles inside the trunk which do the most damage. If the baggage weight limit was 200 lbs. instead of 250 lbs., and people had time to live and let others live, there would be less complaint.

The *Republican's* complaint is accompanied by a graceful recognition of the great improvement in gentility in the railroad service that has been accomplished in the past 20 years. The editor evidently has vividly in mind the rough times of the days of Henry Gray, when the ticket agent at Springfield had a ten-foot pole with which to attack obstreperous passengers through the ticket-window, and contrasts them with these modern days, when the Superintendent of the Boston & Albany feels irritated if a blond brakeman appears on duty without a white necktie, or neglects to get shaved at Worcester on both the down and the up trip. There is no denying that the classic air of Harvard and the esthetic atmospheres of Wellesley and Smith colleges have had their effect on even the sordid souls of the trainmen, and it is a thing to be grateful for, even though John Harvard did have to begin 260 years beforehand in order to accomplish it.

Education for the Railroad Service.

There are a great many boys in the country whose fathers would like to see them go into railroading as a career, and could put them in a way to get a special preliminary education for such career if the opportunity for this education were provided. We are often asked the best way of educating a boy to be a railroad officer, and where he can find that education. In general, these questions are hard to answer. There are ample and most admirable provisions for the special education of engineers and lawyers, and today the railroad departments of civil engineering, mechanical engineering and law are not suffering for want of well-educated and ambitious young recruits. But one can seldom find a young man with any preliminary education fitting him especially for the traffic department, or the transportation department, or the accounting department, or for general administration. There are many men who think that railroading is now a profession so well differentiated from other professions and so well developed and organized that a thorough and comprehensive school training for that profession could be provided with advantage to the men entering it, to the railroad employing them and to the country served by the railroads.

No such comprehensive scheme of education for the railroad profession has ever been laid down and put into practice. There are a number of schools in which special lectures are given on railroad accounting, on the relations of the railroads to each other and to the public, and on railroad economics in general and on certain special features of railroad engineering, in addition to the general courses in civil and mechanical engineering. In these schools admirable and useful work is done, but in none of them has the plan ever been carried out so far as to provide a systematic and comprehensive railroad course.

There is now on foot a project for establishing such a course in one of the great universities. It is still, however, only a project. It is still questionable whether the authorities of the university will consider it advisable to establish the course. But the matter is in such shape that the course would probably be established if it were apparent that there is a large body of well-considered and well-digested opinion in favor of it.

In its present shape the project has been only approximately outlined on paper, but in general it is this: It is proposed to give a four years' course with the degree of Bachelor of Science. The greater part of the studies followed in the course would be those that are now followed in the university, but they would be grouped with special reference to this course. The students would get considerable of what people call, for convenience, "culture studies." They would have English, French and German and a thorough course in mathematics, taking them through the calculus. They would have also a fair training in the fundamentals of civil and mechanical engineering. In these branches the training would not go so far as in the special course pursued in that university by the students studying for those degrees, but it would be carried far enough to fit the young men to become fairly competent engineers if, after a time, they should choose to go into that special calling. To this general course would be added special railroad studies, co-ordinated by a special instructor, and directed by lecturers called from outside for special courses. It would be proposed that in this way the students should learn something of the history of railroads and a good deal about methods of organization and administration. They should learn something of railroad law also and of accounts. They should have considerable instruction in traffic matters which would cover the theory and practice of making rates, and which would include the history of the associations which have been formed at different times and in different countries to control rate making. This alone would be a large and important field. It is proposed also that the students should be taught something of the efforts at government control by states and nations. This would cover the whole history of railroad commissions and would at various points touch the matter of rate making and of traffic associations. The students would also receive instruction in law as bearing especially upon railroad matters and in railroad accounting and finance. It is probable that beyond this there would develop courses of lectures on special matters of engineering and of operation; that is, the topics of care and maintenance of track and structures, of signaling, of the selection and management of rolling stock and of station service would probably be taken up and treated more at length than can be done in the special engineering courses.

This is only an outline of the scheme as it has been laid down and some points may have been omitted, as we have not a copy of the scheme before us while writing.

Now comes the question whether or not it is worth while to attempt to do this, and concerning this we have taken pains to collect considerable opinion, and we find the opinions of very competent men to be quite divergent. Men who have been active in railroad work for many years, some of whom began as messenger boys or chainmen, and some of whom began with college educations, are found on both sides of the question. In another article we shall attempt to sum up briefly the opinions that have been expressed. We print this article merely to call attention to the project and to enlist, if possible, some interest in it, and we shall be glad to learn the opinions of our readers with regard to the matter.

Train-Order Puzzles.

A correspondent in South Carolina asks our interest in a discussion of train-order practice under forms E and F of the Standard Code, different views being held in his office as to the meaning of orders given under those forms. If we were dealing with a general manager instead of a despatcher, we are not sure but we should seize the opportunity to ask him why he did not adopt the block system. Rigid space-interval rules relieve the strain on the despatcher and do away with the necessity for a system in which immunity from collisions depends upon the accurate interpretation of rules or orders which abound in such subtle differences that Philadelphia lawyers can split hairs all day in discussing them. But as long as our present rules are in force, we must, of course, make every effort to simplify and strengthen the practice under them. Our correspondent says:

Under form "E," an order reads "No. 1 will run forty (40) mins. late, A to B." B is not a terminal station and only one time is shown. When is the order fulfilled—on arrival at B or after departure from B? Two positions have been taken on this: (1) that No. 1 can leave B less than 40 mins. late, and (2) that No 1 must leave B not less than 40 mins. late.

Under form "F," "No. 1 will carry signals A to B for engine 85." The stand has been taken that under this form the regular train alone can run as first section, and that engine 85 must be the created train, while on the other hand it is contended that the regular train may be ahead or running as second section, viz., engine 85. Under another example of the same form: "Engines 70, 85 and 90 will run as first, second and third sections of No. 1 A to B," it is maintained (1) that there is still another section, a fourth train, which is the regular train, and that the three engines named are created trains, necessitating carrying of signals by engine 90 in the example cited, while on the other hand it is claimed (2) that there are but three sections in all, and that the regular train may be either first, second or third section, as may be deemed most desirable or convenient. Under the rules in force upon the road on which this discussion has arisen, it is required that the engine number be given in every case.

Under Form "C," order No. 1 is given: "No. 1 has right of track against No. 2, A to D. Nos. 1 and 2 are first-class trains; No. 2, of course, being the superior train, under time card. Order No. 2 reads: "No. 2 and No. 1 will meet at C." Should order No. 1 have been

annulled before order No. 2 was given? Suppose order No. 3 was then given annulling order No. 2. Would these trains then fall back on order No. 1? Suppose in order No. 1, instead of train No. 1 being given the right of track, we give it to extra 500; then make the same meeting point, and follow it by an order annulling order No. 2: what would be the rights of both trains, in relation to each other? Would such orders be permissible?

In the first case the order is fulfilled when No. 1 arrives at B. It has reference only to the movement of train No. 1 between A and B, and is given for the guidance of opposing trains of class inferior to No. 1 between those points. Suppose No. 1 were due at B at 9:20; if you were running No. 2, an inferior train moving in the opposite direction, and were trying to make yourself believe that the first of the two theories was the correct one, how many minutes before 10 o'clock would you deem it necessary to get to B? Evidently different conductors would make different estimates, according to their differing opinions of the time necessary for No. 1 to reach B from the last preceding station, which shows the absurdity of the theory. To state that a train will run to B 40 minutes late, implies that it is known when it is due at B, and the only source of knowledge on this point is the leaving time, given in the schedule. As we have no authority to allow any particular length of time for the stop at the station, how can we allow any time at all? Notes in the Standard Code under Form C, and under other forms, indicate that an order is fulfilled when the train has arrived at the station to which it is given the right to run. If a conductor running in the direction opposite to No. 1 (in the instance cited) is in doubt he must, of course, take care to get to B as much earlier than the postponed leaving time of No. 1 as he thinks may be necessary; but if he thereby causes delay he may be called before the superintendent, in which case we should hope that the superintendent would amend Rule 321 so as to make the leaving time the arriving time, at way stations where only one time is shown. The Train Rule Committee has omitted to do this, we suppose, because it is deemed necessary to give slow trains a chance to get into stations ahead of time, when it is safe to do so; but in view of the fact that trains are every day running ahead of time into stations where an arriving time *is* shown, the same as where such time is not shown, it is hard to see where any difficulty would arise under the modification which we suggest. Why could not rule 392 be modified so as to conform to this suggestion?

The queries concerning orders under Form F can be answered only by the officer who gives the orders. If a despatcher chooses to give an order to a freight engine to run as the first section of a passenger train, we do not see that there is any rule to forbid him. In the case of three engines, 70, 85 and 90, the only way to decide whether 90 is the last section is to find out whether it carries green signals. The form of order in the standard code does not mention green signals, but of course the runner of engine 90 must either carry them or not carry them, and only the despatcher can give him the necessary authority on this point. The first section of a train may be the "regular" train or it may be another train or simply an engine running on the time and rights of a regular train. A time-table train may be late and another train may be sent out on its time carrying signals and run as first section, or an engine alone may be run as first section. There does not seem to be any ground for the idea that if three sections are named there must be a fourth. No matter how many sections are named the last certainly does not carry signals.

The third point is whether an order which gives an inferior train the right of track against a superior train is annulled by the issue of a meeting order for the trains at a point within the district covered by the first order and whether the subsequent annulling of the meeting order restores the original order. It may be said with regard to this that a meeting order for trains having their respective rights of track fixed by time-table does not annul those rights except so far as it suspends them to a given point, and by a fair analogy the rights given by special order would be affected only in the same way, and that, therefore, the special right given by the first order would not be annulled by the meeting order, and that the subsequent withdrawal of that order would leave unchanged the relations of the trains as established by the first order. This will appear still more clearly on consideration of the fact that the meeting order may not actually reach one or both before cancellation. It is, however, best never to put matters in such shape that fine reasoning is necessary to determine the effect of orders. A wise despatcher will make the intention clear beyond question.

Grain Exports.

The publication of the Treasury department statement of exports for August and the eight months of the year to Aug. 31, enables us to make some comparisons of the exports through the different ports, covering several months of the period of heaviest grain movement. We have compiled the exports of corn, wheat and oats for the last three months and for the eight months, from each of the principal ports of export, and in the table below we have figured the percentage of each of the Atlantic and Gulf ports of the total exports from those ports:

	June.		July.		Aug.		8 Mos.	
	1896	1895	1896	1895	1896	1895	1896	1895
New York	51	50	43	47	30	61	31	46
Boston	11	16	14	13	13	14	10	13
Philadelphia	6	4	4	6	8	5	7	8
Baltimore	15	12	18	15	25	14	20	17
New Orleans	7	0	4	1	12	4	16	7
Other ports	10	18	17	18	12	2	13	9

The movement has been so large that every port shows an absolute increase on all the three grains in the eight months, but the percentage of increase differs widely. The increase in the total exports as noted in the large table for the eight months was 57 million bu., or 122 per cent. greater than in 1895. The exports of New York increased 13,200,000 bu., and were 60 per cent. greater than in 1895. This was a smaller rate of increase than that of any other port. Boston increased her exports 73 per cent. and Philadelphia 153 per cent. All of the Southern ports more than doubled their exports, and New Orleans exported over five times as much as in 1895. The rates of increase were: Baltimore, 149 per cent.; New Orleans, 412 per cent., and Newport News, 122 per cent. Galveston exported 4¼ million bu. in 1896, and practically nothing in 1895.

New York has not lost its position as the port of heaviest grain shipments, but its lead has been seriously reduced; and it is no longer true that more than half the grain exported goes out through New York. The three Northern ports together did not obtain as large a proportion of the exports of August as New York alone secured in 1895, and their proportion of the exports of the eight months was little larger than that of New York alone in 1895. Including Baltimore's total, nearly a third of the total movement in the eight months went out of this country through the Southern ports, which in 1895 secured but 16 per cent. of the exports. In June the proportions of the different ports had not materially changed. New York more than held her own, and Philadelphia and Baltimore gained as much as Boston lost that month. In July New York began to lose her proportion, Baltimore and New Orleans gaining half of the loss. In August, however, the declining proportion of the movement secured by New York became noticeable, her share falling from 61 per cent. in 1895 to 30 per cent. in 1896. New Orleans, Galveston and Newport News gained the largest share of this loss, but Baltimore secured nearly half as much of New York's lost proportion as those three ports.

If we take the time since the middle of July, when began the first really free movement of last year's corn, New York has, as we have seen, been rapidly losing. This decrease is in *percentages*. It has caused much alarm, more or less genuine, among New York grain men, and there is ground for their anxiety, for the forces turning grain to the South are stronger than ever before; but it is still to be borne in mind that New York is getting a very large movement. The actual increase in exports is larger than that of any other port, except New Orleans, which reports about the same amount of increase. All available vessel room from New York to Europe has been engaged for months ahead, and ocean rates have more than doubled. The *Journal of Commerce* reports future engagements by vessels of over 5,000,000 bu. With such a large crop and such a free movement as this it is nothing new for other ports to largely increase their percentages, and it still remains to be seen how strong the attractions of New Orleans and Galveston will be when the movement is more moderate in volume.

GRAIN EXPORTS FROM ATLANTIC AND GULF PORTS (in thousands of bushels).

	Corn.		Wheat.		Oats.		Corn, Wheat and Oats.			
	1896.	1895.	1896.	1895.	1896.	1895.	1896.		1895.	
							Quant'y.	P. c.	Quant'y.	P. c.
New York—June	2,542	1,529	1,931	1,072	3,212	20	7,685	51	2,621	50
July	1,239	1,965	1,718	690	3,912	263	6,869	43	2,918	46
August	2,325	2,723	824	978	1,070	436	4,219	30	4,137	61
8 mos. to Aug. 31	12,101	9,324	11,363	11,832	11,671	804	35,135	31	21,960	47
Boston—June	286	272	1,157	592	184	0	1,627	11	864	16
July	806	551	1,029	236	444	0	2,279	14	787	13
August	620	628	1,036	346	246	0	1,902	13	974	15
8 mos. to Aug. 31	5,224	3,005	5,583	2,935	1,505	1	10,312	10	5,941	13
Philadelphia—June	358	196	543	24	123	0	1,024	6	220	4
July	515	262	160	120	0	0	675	4	382	6
August	546	182	624	119	0	0	1,170	8	301	5
8 mos. to Aug. 31	4,578	1,703	2,156	1,113	409	0	7,143	7	2,816	8
Baltimore—June	1,184	455	506	152	534	1	2,224	15	608	12
July	1,072	475	946	468	809	1	2,827	18	944	15
August	1,639	292	1,198	634	770	0	3,607	25	926	14
8 mos. to Aug. 31	14,205	4,832	3,491	3,233	2,428	2	20 124	20	8,067	17
New Orleans—June	591	1	489	17	12	1	1,092	7	19	0
July	265	31	349	5	3	1	617	4	37	1
August	1,432	234	267	4	47	0	1 746	12	238	4
8 mos. to Aug. 31	14,896	2,545	1,625	705	146	4	16,667	16	3,254	7
Galveston—August	216	....	310	.....	.....	.....	526	4	.....	0
8 mos. to Aug. 31	3,904	....	331	.....	.....	.....	4 235	4	.....	0
Newport News—August	439	42	.....	110	618	.....	1,057	8	152	2
8 mos. to Aug. 31	6,735	3,368	13	1,104	3,212	.....	9,960	9	4,472	9
Other ports*—June	582	512	470	436	504	0	1,456	10	948	18
July	1,004	609	726	484	1,069	11	2,799	17	1,104	18
Total—June	5,543	2,965	5,096	2,283	4,569	22	15,108	100	5,270	100
July	4,901	3,893	4,928	2,003	6,237	276	16,066	100	6,172	100
August	7,227	4,101	4,259	2,191	2,751	436	14,237	100	6,728	100
8 mos. to Aug 31	59,643	21,777	35,562	20,922	19,371	118	103,576	100	46,510	100

* Including Galveston and Newport News, but excluding Pacific Coast ports.

August Accidents.

Our record of train accidents in August, given in this number, includes 48 collisions, 54 derailments and 2 other accidents, a total of 104 accidents, in which 57 persons were killed and 140 injured. The detailed list, printed on another page, contains accounts only of the more important of these accidents. All which caused no deaths or injuries to persons are omitted, except where the circumstances of the accident, as reported, make it of special interest.

These accidents are classified as follows:

COLLISIONS:	Rear.	Butting.	Crossing and other.	Total.
Trains breaking in two	9	0	0	9
Misplaced switch	2	1	2	5
Failure to give or observe signal	1	0	2	3
Mistake in giving or understanding orders	0	8	1	9
Miscellaneous	2	3	2	7
Unexplained	5	3	7	15
Total	19	15	14	48

DERAILMENTS.			
Loose or spread rail	2	Broken engine	1
Defective bridge	3	Misplaced switch	1
Broken wheel	1	Animals on track	1
Broken axle	6	Landslide	3
Broken truck	1	Washout	2
Fallen brakebeam	1	Accidental obstruction	5
Broken drawbar	4	Unexplained	20
Broken brake rigging	2		54
Broken car	1		

OTHER ACCIDENTS.	
Broken side rod	1
Breakages of rolling stock	1—2
Total number of accidents	104

A general classification shows:

	Collisions.	Derailments.	Other accid's.	Total.	P. c.
Defects of road	0	5	0	5	5
Defects of equipment	9	17	2	28	27
Negligence in operating	24	1	0	25	24
Unforeseen obstructions	0	11	0	11	10
Unexplained	15	20	0	35	34
Total	48	54	2	104	100

The number of trains involved is as follows:

	Collisions.	Derailments.	Other accid's.	Total.
Passenger	23	10	2	35
Freight and other	59	44	0	103
Total	82	54	2	138

The casualties may be divided as follows:

Killed:	Collisions.	Derailments.	Other accid's.	Total.
Employees	20	19	0	39
Passengers	0	1	0	1
Others	6	11	0	17
Total	26	31	0	57
Injured:				
Employees	44	9	0	53
Passengers	45	23	0	68
Others	4	15	0	19
Total	93	47	0	140

The casualties to passengers and employees, when divided according to classes of causes, appear as follows:

	Pass. Killed.	Pass. Injured.	Emp. Killed.	Emp. Injured.
Defects of road	0	0	0	2
Defects of equipment	0	4	3	0
Negligence in operating	0	45	21	44
Unforeseen obstructions and maliciousness	0	4	11	4
Unexplained	1	15	4	3
Total	1	68	39	53

Twenty-seven accidents caused the death of one or more persons each, and 24 caused injury but not death, leaving 53 (51 per cent. of the whole) which caused no personal injury deemed worthy of record.

The comparison with August of the previous five years shows:

	1896.	1895.	1894.	1893.	1892.	1891.
Collisions	48	53	25	50	91	111
Derailments	54	71	89	90	119	110
Other accidents	2	8	9	7	8	2
Total accidents	104	132	150	147	221	223
Employees killed	39	30	25	28	35	34
Others killed	18	19	25	38	15	55
Employees injured	53	41	94	67	104	152
Others injured	87	99	42	95	109	189
Passenger trains involved	35	48	44	55	68	92

Average per day:						
Accidents	3.36	4.26	4.84	4.74	7.13	7.19
Killed	1.52	1.58	1.61	2.13	1.61	2.94
Injured	4.52	4.52	4.39	4.94	8.69	11.00
Average per accident:						
Killed	0.45	0.37	0.33	0.44	0.22	0.40
Injured	1.34	1.06	0.90	1.04	0.96	1.52

We find no account of any passenger killed in a passenger train in August, but there were a number of notable disasters to passenger trains. There was a bad collision at Birkbeck, Ill., and another at Valencia, Pa., in the latter of which three trains were mixed up. There was a derailment of a passenger train at Concord, N. H., on the 27th, due to a displaced switch, and according to the verdict of a coroner's jury on the death, some time afterward, of a person who was injured in the accident, the means which would have prevented the derailment were very simple. The verdict says that the accident was caused by a misplaced switch and that "if the switch had been locked the accident would not have occurred." Near Bosworth, Mo., on the 3d, a butting collision of passenger trains occurred on a trestle 60 ft. high. The first serious accident on the Manitou & Pike's Peak road, since it began operations, occurred Aug. 30.

The total number of persons, other than employees, reported killed or injured in August is 36, most of whom were tramps.

The total number of electric street car accidents of which we gathered accounts in August is 28. The number of persons reported killed in these accidents was nine and of injured 158. The average number of casualties per accident is perhaps no larger than many previous months; in fact, a large number of these cases are such as would be classed as of minor importance, but every one of the 28, except two, is reported to have caused more or less injury to persons. Whatever the average shows, however, there were two runaways accompanied by serious disaster. In Columbia, Pa., on the 9th, an accident of this kind resulted in the death of six persons and the injury of over 50. The verdict of a coroner's jury which investigated this case holds the company largely responsible for: Allowing the car to be overloaded with passengers; allowing passengers to crowd and ride on platforms; allowing an inexperienced boy to conduct the car; in not equipping this car with facilities for dropping sand on the rails: in not having this car properly inspected before it was taken out on Aug. 9.

The other runaway was near Frederick, Md., on the 23d. No person was reported killed, but over 40 were injured. The other accidents were in the usual variety. Of rear collisions there were seven, one of which was caused by the failure of lights in the foremost car, in consequence of the cessation of the electric current. Of other collisions there were five. There were five runaways, including the two above mentioned, and three cases where railroad trains ran into street cars. In Brooklyn, N. Y., on the 7th, a street car ran into a wagon and pushed it upon the adjoining track in the face of a street car running in the opposite direction, completely demolishing the wagon. There were two cases of collisions with fire engines.

Annual Reports.

Erie.—The fourth receivership of the road was ended on Dec. 1, 1895, when the New York, Lake Erie & Western, whose history had been at times both sensational and turbulent, passed out of existence, and the Erie Railroad Co. came into possession of the property. A report, very full and complete in every way, has just been issued covering the results of the first seven months of the fiscal year of the new company.

The general results for the seven months are given below:

EARNINGS.

	1896.	1895.	Inc. or dec.	
Freight	$9,115,996	$8,295,710	I.	$820,285
Coal	3,571,560	3,548,127	I.	23,433
Passenger	3,104,350	2,907,123	I.	197,226
Express and mail	571,151	543,549	I.	27,602
Rentals and misc.	654,318	705,198	D.	50,880
Total earn.	$17,017,376	$15,999,708	I.	$1,017,667

EXPENSES.

	1896.	1895.	Inc. or dec.	
Maintenance of way & structures	$1,739,276	$1,632,732	I.	$106,544
Maintenance of equipment	2,426,344	2,159,362	I.	266,981
Conducting transportation	7,996,344	7,673,819	I.	322,525
General exp.	327,428	392,754	D.	65,326
Taxes	388,032	498,004	D.	109,972
Total exp.	$12,877,423	$12,356,671	I.	$520,752
Net earn.	$4,139,953	$3,643,037		$496,915
P. c. of expen. to earn.	77.23	75.67	D.	1.56

NOTE.—The above statement does not include the earnings and expenses of the New Jersey & New York road. The New York & Greenwood Lake having been leased May 1, 1896, the earnings and expenses of that property are included for the months of May and June only in each year.

The months covered by the report are those in which earnings are the lightest in the year and the expenses the heaviest, for they include the winter and spring seasons with their extra expenses; summer and fall are the best part of the company's year, and the gross earnings per month then are much greater than in winter and spring. Bearing in mind these considerations and the general dullness of the year, which affected the Erie, particularly in a heavy falling off of its coal tonnage, which furnishes 32 per cent. of the total ton mileage, the results for the period covered by the report are exceedingly favorable. In gross earnings the increase reported is 6.3 per cent. and in net earnings 13 6 per cent. The net income from traffic is reported as $4,195,499, and the proportion of interest and rentals for the seven months was $4,043,790, leaving a balance to the credit of profit and loss of $151,709, the company thus earning its full fixed charges for the period and having a small surplus. In the year to June 30, 1895, there was a deficit of $1,113,173. The figures given above, however, do not include any interest on the general lien bonds, of which over 31 million dollars are now outstanding. These bonds did not draw interest until July 1, 1896, the rate being 3 per cent. for two years and 4 per cent. thereafter.

There is an increase in traffic earnings from all sources except express, as compared with the corresponding seven months of 1895. The increase in earnings from general freight was a substantsal one, 9.89 per cent., due to an increase of 5.38 per cent. in ton mileage, and a small increase in the average rate. The coal traffic, which furnishes 39 per cent. of the revenue of the Erie, was in poor condition throughout the year. The tonnage fell off nearly 5½ per cent., but as the average length of haul increased from 122.8 miles to 131.2 miles (6.91 per cent.), the ton mileage increased over 7½ million miles, so that there was a slight gain in revenue as compared with 1895. Over 2,683,000 tons of the coal tonnage was anthracite coal and 1,945,000 tons bituminous. The anthracite coal carried increased over 8 per cent. and coke about 16 per cent., but the tonnage of bituminous coal fell off 165.000 tons, or 7.8 per cent. The poor results reported in the coal traffic, the falling off in tonnage and in the ton-mile rate is attributed entirely to the depressed condition of the trade. The passenger revenue on the Erie is about 18 per cent. of the total traffic revenue, and in the period under review shows an increase of 7.8 per cent. There were increases in the number of passengers carried, in passenger mileage, in length of journey, and a small increase (3 per cent.) in the average receipt per passenger per mile. Both through and local business increased: but because of the very large proportion which suburban traffic is to the total passenger movement the average rate and average journey is very low, being 1.668 cents and 24.3 miles respectively.

The operating expenses this year include unusually large items, but no comparison is given with the previous year of the expenditures under the different classifications. The expenses charged to conducting transportation increased 4.2 per cent.; maintenance of equipment, 12.3 per cent.; maintenance of way and structures, 6.5 per cent. The different items under the latter head include 12,780 tons of 80-lb. and 90-lb. rails put in the track; 70 miles of track reballasted and a large proportion of the entire tie renewals needed in 1896. The increase in expenses is entirely in these three accounts. Other expenses under this head include the building of 7.7 miles of side tracks and four new stations; four other stations are now being erected. The repairs on equipment have been especially heavy and have included $135,000 for air-brakes and automatic couplers. At the close of the year over 10 per cent. of the total locomotives, nearly 6 per cent. of the passenger equipment and over 5 per cent. of the freight cars were undergoing repairs. An unduly large proportion of the freight cars are old and of light capacity and will have to be replaced as rapidly as possible. As the old cars are destroyed they are replaced with modern cars equal in aggregate tonnage to that of the old cars destroyed. Later, when the great proportion of small cars is reduced, each old car when dismantled will be replaced with a new 30 or 35-ton car irrespective of the tonnage of the old car. The increase of expenses for conducting transportation is, of course, due to the heavier traffic movement represented by an increase of 6.3 per cent. in ton mileage and 3.5 in passenger mileage. The average load per car, both freight and passenger, shows an increased economy over last year. A large portion of the increase in traffic has been live stock, perishable and other fast freight.

The gross earnings per mile of road show excellent earning capacity, as the following comparisons indicate:

	1896.	1895.	Inc., p. c.
Gross earnings per mile	$8,110	$7,625	6.36
Net earnings per mile	1,973	1,736	13 6
Freight earnings per mile	6.047	5,645	7.1
Passenger earnings per mile	1,751	1,644	6.5

The train load varied but slightly in the two periods, being 225 tons in 1896 and 224 tons in 1895. The freight carload shows a similar slight improvement, the average load increasing from 12.4 tons to 12.8 tons. The passenger train load also shows a uniformity in the two years. In 1895 the company's trains carried 41.2 passengers on the average and 41.04 in 1896, and the average number of passengers per car also fell off. The following tatistics covering the traffic movement show the changes in two years *in thousands:*

	1896.	1895.	Inc.	
General freight tonnage	6,076	5,766	I.	5.3
General freight ton mileage	1,456,907	1,335,584	I.	9.
Coal tonnage	5,329	5,636	D.	5.4
Coal ton-mileage	699.686	692.140	I.	1.
Total ton-mileage	2,156,593	2,027,725	I.	6.3
Freight-train earnings per mile.	$1.32	$1.31	I.	.8
Average haul	189	177	I.	6.3
Rate per ton per mile	.588c.	.584c.	I.	.68
Rate per passenger per mile	1.668c.	1.618c.	I.	3.0
Passenger train mileage	186.071	179.729	I.	3.5
Passenger train mile earn.	81.6c.	79.1c.	I.	2.3
Net earn. per train mile	29.3	27.2	I.	7.7

During the year the company has been engaged in enlarging the coal docks, at Buffalo and Cleveland, constructing third and fourth main tracks just west of Jersey City, which will facilitate the handling of suburban passenger traffic; the revision of the Pine Valley curves and grades on the Nypano line east of Corry, which, when completed, will permit larger train-loads over that division; enlarging the yards and terminals and adding to the general terminal facilities, the work under this head including the rebuilding of the Black coal dock at Buffalo, which now has a capacity of over a million tons a year. This work has cost $140,000, of which $50,000 was charged to operating expenses and the balance to construction. The net sum charged to capital account for construction work was $153.009. The new equipment purchased and charged to capital account has included one thousand 30-ton box cars, two thousand 30-ton twin-hopper coal cars and three hundred and twenty-five 30-ton drop-bottom gondolas. The company has under contract twenty 10-wheel locomotives, now being delivered, which will be charged to capital account, and one hundred 30-ton box cars to replace vacant numbers. A satisfactory arrangement has been made with the city of Buffalo for removing the company's grade crossings there, and an agreement will also probably be reached shortly with the authorities of Jersey City for the elevation of the tracks in that city.

Carrying out the reorganization plan 2½ millions of the reorganization first lien bonds and $3,344,000 of collateral trust bonds have been discharged during the year and $580,000, the total bond issue of the Buffalo, Bradford & Pittsburgh has been taken up by the Reorganization Committee, and will be retired by the Erie's general lien bonds. The new company secured a fund of about five million dollars provided by the reorganization for new construction and improvements, and of this $686,00 has been spent for 1,000 box cars, $153,900 for construction work, and $396,000 for stock of the New Jersey & New York road. In addition to this cash fund the reorganization reserved five million prior lien bonds and 17 million general lien bonds, the company having authority to issue the latter at the rate of one million dollars a year for construction requirements and improvements.

President Thomas has some remarks upon methods of taxation of railroads, pointing out that over 3 per cent. of the Erie's gross earnings are paid out as taxes. The taxing bodies do injustice not only by increasing the rates, but by unduly raising the values and, in some cases, levying double taxes, for the company's earnings are taxed and the property itself is taxed. While railroads should contribute their fair share of government taxes, President Thomas protests against the idea that "it is thoroughly legitimate to require a railroad company to make good the deficit of the town treasury or to serve as a general rate reducer by submitting to exhorbitant assessments."

One of the most important evidences of progress which the report offers is the account of what has been done in consolidating the railroads operated by the New York, Lake Erie & Western under various complicated agreements. The directors announce in this report that very little now remains to be done to carry out the policy of the reorganization plan to vest the ownership of the various properties embraced in the system, as far as practicable, in the parent company. The company now owns directly the entire line from New York to Chicago, and the more important of the leased lines have also been merged. Besides the Nypano road, the Buffalo & Southwestern, extending from Buffalo to Jamestown, 63 miles; the Lockport & Buffalo, a valuable feeder extending to Tonawanda; the Suspension Bridge and Erie Junction, which gives the Erie a connection with the Canadian Lines; the Buffalo, New York & Erie, a valuable line 140 miles long forming the larger part of the Rochester line and giving the Erie its Buffalo terminal, and the Union Steamboat and Union Dry Docks companies have all been merged with the Erie Railway, that company issuing its own stocks and bonds to replace the capital stock of the merged corporations This policy will be continued as rapidly as possible. It has been of particular benefit in regard to the important suburban lines in New Jersey radiating from the Jersey City terminal. Business on these lines has steadily grown, taxing the facilities of the company; but they have been operated under many disadvantages and their financial relations to the Erie Company were complicated. Several of the companies have used the Jersey City terminal merely as tenants, other lines being operated upon a percentage of the gross earnings and none of them paying a proper charge for the valuable terminal facilities they used. New contracts have been made with all of these companies, and with the most important the New York & Greenwood Lake, a large part of whose securities have long been owned by the company, a lease was effected, the Erie assuming a rental equal to the fixed charges. Under the new agreement the New York & Greenwood Lake issued 1½ millions of five per cent. bonds, retiring all its funded debt and providing ample funds for placing the property in good condition; and the work of double-tracking the line from Jersey City to Montclair Heights, 11¼ miles, provided for in this arrangement, has already been begun. The company now has with one exception direct control of all the roads using its Jersey City terminal, which puts it in a position to develop still further the suburban business of these lines, which are admirably located for that traffic. The directors believe that street railroad competition will not be serious, but rather that their location is such that electric railroads will be built to act as feeders to

the Erie. It is stated that the directors have considered the advisability of equipping some of these lines with electricity. A map showing the suburban lines and the territory which they reach is issued with the report.

Great Northern.—The report to June 30, 1896, includes the movement of a good portion of the last heavy crop in the Northwest and, like all the roads with lines through that district, the Great Northern reports largely increased earnings. The increases were 18 per cent. in gross earnings and 28 per cent. in net. Previous reports have given the results on the proprietary lines separately, but this year the results have been combined in one general statement. The following table gives the earnings of all the lines operated by the Great Northern, which includes the Eastern Minnesota and other leased lines, 4,374 miles in all:

	1896.	1895	Inc. or dec. P. ct.
Freight	$15,833,090	$13,234,560	19.63
Passenger	2,648 854	2,292,343	15.55
Mail, exp.. etc	1,130,620	1,003,521	12.67
Total	$19,612 564	$16,530,424	18.65

The proportions of the different items of freight to the total earnings were almost uniform in the two years. Freight revenue was 80.72 per cent. of the total in 1896, and 80.06 in 1895. Passenger revenue was over 13½ per cent. in both years, and mail earnings were 2¼ per cent. of the total in 1896 and 2½ in 1895. Maintenance of equipment charges were $265,000 larger, but $40,000 less was spent on roadbed and structures. The low ratio of operating expenses, for which the Great Northern has been noted, makes a new record, falling from 55.5 per cent. in 1895 to 52.1 in 1896. Including taxes the ratio is 58 8 and 55.3 per cent. The share of the receipts saved is more noteworthy when we remember how thin the traffic is. Gross earnings per mile were $4,483 in 1896, but net earnings were $2,145, the former of course being a low figure, while the last is about what is reported by many roads in the well settled districts of the country. In 1895, gross per mile was $3,779, and net per mile was $1,679, the increases in 1896 thus being shown to have been considerable.

There is a further increase in the very high average train haul of the company from 252 tons to 256 tons. The earnings per ton-mile were .976 cent against .984 cent in 1895. The revenue ton mileage was 1,622 millions, increasing 20.6 per cent. Passenger mileage increased 15.9 per cent. The earnings per freight-train mile were $2.55 in 1896 and $2.52 in 1895. The total earnings per train-mile were $2.10 and the net earnings per train mile from traffic were $1, all these items showing a slight increase.

Further progress was made during the year in diversifying traffic and the advance in this direction was never more marked than in the last year, although much of the increased traffic volume was due to the phenomenal crops. Nearly 70 million bushels of wheat alone were transported in the year. President Hill has some remarks on low rates and states that it is a fact beyond dispute that during the last 20 years the carrying rate has fallen faster than the price of any other commodity bought or sold in the markets of the country. The tonnage of the Great Northern, he says, is substantially of the same description in 1896 as in 1881. In the latter year the ton-mile rate was 2.88 cents and in 1896 it was .976 cent, only a little more than one-third of the former rate. Had the ton-mile earnings of the company been as much in the latter as in the earlier year, the total earnings would have been more than 46¾ million dollars, or nearly 40 million dollars more than the companies actually collected. The rate of wages paid by the company is now 45 per cent. higher than in 1880.

During the year, nearly 18,000 new settlers, an unusually large number, have located along the line and the settlement of the new country is going on more rapidly than for several years past.

The equipment purchased during the year included 15 mogul freight engines, two switching engines, four sleeping cars, 12 baggage and mail and express cars, 750 60,000-lb. box cars equipped with automatic couplers and air-brakes, and 400 60,000-lb. capacity ballast cars. Of this equipment nine engines, eight baggage and express cars and 300 of the box cars were for the Great Northern and the balance of the equipment for its leased lines. The equipment of cars with air brakes and automatic couplers has been actively carried on during the year.

The income account after the payment of five per cent. dividends shows a balance of $1,042,000, but during the year $405,000, representing advances made prior to July 1, 1894, for interest on the Duluth, Watertown & Pacific Railway bonds, was charged off, leaving a net balance of $636,922.

Nashville, Chattanooga & St. Louis.—The results of operations last year show considerable improvement over 1895, in both freight and passenger revenues, though the company has not yet recovered all that it lost in 1893. The net income was $1,951,277. Interest and taxes called for $1,078,470; dividends, $400,000, and the Western & Atlantic rental, $420,012, so that there was left a surplus of $52,795 instead of a deficit as was reported in 1895.

The general results of operations for three years were:

	1896.	1895.	1894.
Gross earn	$5,074,625	$4,608,502	$4,521,662
Oper. expen	3,164,350	2,726,366	2,671,179
Net earn	1,910,275	1,882.142	1,850,483
P. c. exp. to earn	62.3	59.1	59.1

There were increases in all items of expenses, maintenance of way increasing $170,450; maintenance of equipment, $46,059, and conducting transportation $222,233. The increase in the first item appears to have been chiefly due to 35 miles of new 68-lb. rails laid in the track, the renewal of 330,000 cross ties, strengthening bridges and filling in trestles. The increased cost of conducting transportation is readily accounted for by the increased movement. The ton mileage last year was over 381.9 millions, 27.8 millions more than in 1895. The ton-mile rate shows a decline from .93 cent to .83 cent. The passenger rate per mile shows a large decrease, from 2.58 cents in 1895 to 1.67 cents in 1896. Earnings per mile for the last four years show the very slow recovery from the adverse conditions of 1893.

	1896.	1895.	1894.	1893.
Gross earn. per mile	5.625	5 109	5,109	6,335
Net earn. per mile	2,117	2.086	2.090	2,459

The Western & Atlantic, which is leased from the State of Georgia, for an annual rental of $420,012, this year reports a surplus of $143,000 instead of the usual deficit.

Show collisions of locomotives are getting to be commonplace out West, the originator of the scheme having had so many of them that he now identifies the different occasions only by numbers; but evidently not all experimenters in this line understand the tricks neeessary to carry out the show successfully, for we read that near Waco, Tex., on the Missouri, Kansas & Texas, last week, where two engines and seven cars were smashed up, nine spectators were badly injured by falling wreckage, two of them fatally. A "dead line" had been fixed 300 ft. from the track, but it appears that the boilers of both engines exploded. The report estimates that 50,600 persons witnessed the collision, a number which no doubt represents an aggregate amount of enjoyment so great as to make the matter of a few fatal accidents seem like a mere trifle. But whether all of the 50,000 paid an admission fee is a question on which we are not enlightened. The preparations for this exhibition, which seem to have been made by the railroad company, were quite elaborate. A dining room 50 ft × 75 ft. was built, together with a band stand, a reporters' stand, a refreshment booth and a stand from which to take photographs. There was also ample provision for side shows, and a platform 1,700 ft. long for passengers to alight upon.

The restoration of freight and passenger rates by the railroads affected by the injunction of Judge Speer will take place at various dates between now and Oct. 1. The officers of the Seaboard Air Line seem to have been in doubt as to the extent to which the order of the court affected their road and some of their restorations were not made until the issue of a second injunction, on Saturday last, by Judge Hughes, of the United States Circuit Court, Eastern District of Virginia. This injunction was against the continuation of low rates, and the complainants were the Baltimore Trust & Guarantee Company and other financial institutions holding bonds of some of the roads. A hearing on this injunction will be held at Richmond, Oct. 20. It appears that Judge Speer's injunction, being issued in the Fifth Judicial District, affects but a small proportion of the territory in which the worst part of the rate war was being carried on.

The Manhattan Elevated road, New York City, is now running through trains over the Suburban and the Third Avenue lines between 177th street and the City Hall, a distance of about 12 miles. There are 13 trains down (southward) in the morning and 10 up (northward) in the afternoon. The running time is 52 minutes. This arrangement is in accordance with the decision of the State Railroad Commissioners, who held that these through trains ought to be run (across the Harlem River) in spite of the possible disarrangement of schedules by the opening of the draw-bridge.

NEW PUBLICATIONS.

A Graphic History of Silver and Silver Coinage in the United States from 1757 to 1896. Prepared and published by John L. Williams & Sons, Bankers, Richmond, Va.

This is a sheet 21 in. by 17 in. showing graphically in one line the commercial ratio of silver and gold from 1757 to 1896, and in another line, drawn to the same scale, the mint ratio from 1792 to 1896. This diagram alone would convince any engineer or other person accustomed to read diagrams, of the hopelessness of any effort to keep these two ratios anywhere near each other. The diagram also shows the value of silver per ounce in gold and the value in gold of the present silver dollars at each of the prices per ounce. It shows further various historical facts, as, for instance, when the United States mint was established (1792), the amount of silver dollars coined in various periods, the dates of demonetization of silver by various nations, and, very briefly, the dates and terms of the Bland-Allison bill and the Sherman bill. A table on the diagram gives the world's production of gold and of silver, year by year, from 1860 to 1895, and for each year the ratio of the production of silver to gold. Thus the diagram becomes a most convenient and useful document for the student of this question now so absorbing. One great fact which cannot be too often repeated is that in the 23 years since we demonetized silver we have issued, either in actual coin or in coin certificates issued against silver bullion, about seventy-five times as many dollars as we coined during the whole period of 81 years of free coinage. In other words, in these last 23 years we have issued in coin or in coin certificates $601,247,511 in standard silver dollars. In the 81 years of free coinage of gold and silver we coined 8,031,238 silver dollars.

Poor's Manual of Railroads. H. V. & H. W. Poor, 44 Broad street, New York City. Price, $7.50.

The volume for 1896, the 29th annual number, from which we gave extracts on Aug. 28, page 603, has just been issued. Year by year, as the volumes have been published, we have had occasion to commend the industry of the compilers in gathering and setting forth the extensive statistics accessible only here. The *Manual* grows in usefulness and is more than ever indispensable. Each year brings changes and improvements, not altering the familiar general characteristics, but adding to the value of the reports of the companies. This year the statements of the principal companies are given in greater detail. The *Manual* now contains the reports of 4 399 corporations and has 258 more pages than the 1895 edition. In recent years a feature of the *Manual* has been the increasing space given to reports of street railroads. This year returns are given for 2,040 steam railroads, 1,208 street railroads and 143 industrial corporations besides statements of indebtedness of 1,008 states, counties, cities, towns, etc. The publishers call attention, and not without reason, to the fact that notwithstanding the material enlargement of the book, they have not raised the price.

The *Directory of Railroad Officials*, formerly published as a supplemental volume, is this year included in the *Manual*.

TRADE CATALOGUES.

Westinghouse Engines. The Westinghouse Machine Co., Pittsburg, Pa.

The Westinghouse Machine Co. has issued a little pamphlet giving considerable information about the Westinghouse engines with many interesting illustrations. In the introduction it is said that after fourteen years of effort, the company has 7,000 engines now working in all parts of the world, and over 25 per cent. of these orders are from old customers. A chapter of considerable value is a short one on "Economy," in which actual data are given. Lists are given of dimensions, weights and other particulars of automac compound engines, running from 35 H. P. up to 740; of simple standard engines from 5 H. P. up to 312, and of simple "Junior" engines from 5 H. P. up to 93.

The Pneumatic Engineering Company, 100 Broadway, New York, sends us a pamphlet describing the Titus Pumping System, being a method of raising fluids by the air lift. The company is prepared to furnish complete pumping outfits and will give estimates on any well or group of wells. The company sends also a pamphlet describing its improved, straight-lift pneumatic hoist.

Department of Public Works, Chicago.

The Mayor's Message and the Twentieth Annual Report of the Department of Public Works to the City Council of Chicago for the year ending Dec. 31, 1895, has just been issued and forms a large volume, containing full reports of the various departments of the city.

The Mayor's Message points out that in 1895 a civil service law was put into thorough and complete operation; the long-pending dispute with the Illinois Central Railroad over the lake front was finally settled; provision was made for the elevation of many miles of railroad and the different railroads of the city are now manifesting a disposition to co-operate with the city in future elevation work.

The total cash shortage on Jan. 1, 1896, was $5,148,462. The bonded debt was reduced during the year 1895 by $534,000. A decrease of $678,379 was made in the pay rolls of the Department of Public Works over the same time in 1894, while an unusually large amount of work was done.

During the year 91,121,532,749 gals. of water were pumped into the city mains, an average of 251,839,816 gals. per 24 hours. This was an increase over the total amount pumped in 1894 of 4,847,589,400 gals., while the expense of all the stations for 1895 was $30,130 less than for the preceding year. A new tunnel is now under construction which will give additional water facilities.

During the year 1895 350,405 ft. of water mains were laid, making a total of 1,612 miles.

The reports on streets and alleys shows that 42½ miles of streets and 5½ miles of alleys were paved. The introduction of vitrified brick on Milwaukee avenue, and of sheet asphalt on Madison street, between Jefferson street and Center avenue, marks a new departure in street paving in Chicago.

In 1895, 37 miles of sewers were constructed at a cost of $356,950, making the total number of miles 1,248 The cost of repairs to sewers amounted to $52,665, being an average cost of $42 per mile. The cost of cleaning was $134,424, or an average cost per mile of $108.

The report of the Commissioner of Buildings shows that 8,633 buildings were erected, extending over an aggregate frontage of 41⅛ miles, at a cost of about $35,000,000.

At the end of the year 1895, the city was using for lighting 37,846 gas lamps, 1,611 electric lights, 11,309 gasoline lamps and 194 oil lamps. The total cost to the city for lighting for the year was $1,022,546.

The Van Buren street bridge over the Chicago River was built at a cost of $169,700, the bridge at Fullerton avenue, spanning the North Branch of the Chicago River, was built at a cost of $26,753, and the high bridge at Diversay avenue for $32,000. The cost of maintaining all the bridges was $148,936.

Electric Power to be Transmitted 3 M

A power transmission plant, notable both in size and in the distance the power is to be transmitted, is in course of construction in the state of Utah. It is that of the Pioneer Electric Power Company of Ogden, which, within the past month, has contracted with the General Electric Company for a complete 5,000-H. P. three-phase plant, with a line for transmission 36 miles from Ogden to Salt Lake City.

The power will be obtained from the fall in the canon of the Ogden River, at a point just outside the limits of the city of Ogden. Across the head of the Ogden Canon a dam is to be thrown, and an immense storage reservoir formed, which will cover some 15 or 20 square miles of a valley in the mountains. From this dam to the power-house, a distance of nearly six miles, the water will be carried through a 6-ft. pipe of wood for about five miles, and for the rest of the way through a 6-ft. pipe of riveted steel. These pipes are fitted at intervals with automatic relief and air valves to prevent bursting or collapsing when the flow of water is varied by changes of load. The effective head of water at the power-house will vary from 400 to 450 ft., and the full capacity of the pipe line will be 10,000 H. P.

Two receivers will be used, one at each side of the power-house, so that either can be shut down without stopping the plant. To these the pipes running to the water-wheel nozzles will be connected. The speed of the wheels will be controlled by Knight governors and the valves will be operated by hydraulic pistons, so that the generators may be stopped and started from the switch-board. The water from the wheels on each side of the power-house will pass into a central tail race under the

Valley of the Ogden River, near Ogden, Utah.

floor between the two lines of generators, and will be conveyed into canals for the irrigation of some 18,000 acres of land in the vicinity of Ogden, which will be reclaimed for farming purposes.

The electric plant at first will consist of five 1,000 H. P. 24-pole three-phase generators, driven by Knight water wheels running at 300 revolutions a minute. The water wheels and fittings will be furnished by the Risdon Iron & Locomotive Works, of San Francisco. Water wheel and armature are mounted on the same shaft, and are supported by the same base frame and bearings. The periodicity of the current is 60 cycles per second, and the generators will be wound for 2,300 volts.

Two exciters each of 100 K. W. capacity direct connected to their own water wheels will be provided, either of which will suffice to excite the fields of all the generators in the completed station.

The current from the generators will be carried by lead covered cables laid in ducts between the generator foundations and the wall of the building, to the generator switchboards at one end of the power-house. The boards will be blue Vermont marble panels, and will be completely equipped with all the necessary controlling and regulating instruments and apparatus. Tachometers on the switchboard, operated by synchronous motors electrically connected to the generators, will indicate the speed of the machines.

The step-up transformers and the 2,000 and 15,000 volt feeder panels will be placed in a gallery erected over the generator switchboard. The transformers, nine in number, each of 250 K. W. capacity, will raise the generator potential from 2,300 volts to 15,000 volts; at which pressure 2,000 H. P. will be transmitted to Salt Lake City. The local distribution of the balance at Ogden will be made at 2,300 volts.

The transmitted current will pass over six No. 1 wires strung on insulators of a special porcelain, developed by the General Electric Co. to withstand high potentials, to nine 250 K. W. step-down transformers at Salt Lake City, which will deliver it at 2,300 volts for distribution.

The transmission line and transformers will be arranged to allow of the use of a potential of 25,000 volts. This will permit of the efficient transmission of current to the mining regions of Mercur and other camps 30 to 35 miles beyond Salt Lake City. All lines will be protected by the latest types of General Electric lightning arresters, which have proved so efficient in other transmissions.

To construct the iron and wooden pipe conveying the water to the wheels, motors aggregating 100 H. P. are set up in the shops of Rhodes Brothers in Ogden, supplying extra power for the work, which is one of the most extensive pipe-line contracts ever undertaken. Practically all the work will be done on the ground, the steel being received in flat sheets to be rolled, punched and riveted in the shops, and the lumber for the wooden pipe in the rough to be milled, planed and put together on the spot.

Salt Lake City, with the completion of the Pioneer plant, will receive power from two of the most important electrical transmission installations ever undertaken. That transmitting the power from the Big Cottonwood Canon has only recently been completed; that of the Pioneer Company will probably be put in service about Nov. 1 of this year.

TECHNICAL.

Manufacturing and Business.

The Standard Steel Works and the Baldwin Locomotive Works will shortly open offices in the Monadnock Building, Chicago, in charge of Mr. Chas. Riddell. Fitzhugh & Spencer, who have heretofore represented these companies in Chicago, give up the agency.

Mr. Alexander Friedmann of Vienna, Austria, the largest railroad supply house in Europe, with branches in the principal cities, is agent on the continent for the pressure regulators and reducing valves manufactured by the Foster Engineering Co., of Newark, N. J. In addition to large previous shipments to Mr. Friedmann, the Foster Company has just received an order from him for 40 pressure regulators to be used as air-brake pump governors and for the steam heating of trains on railroads in France.

At a recent meeting of the directors of the Boston & Lockport Block Company, held at Lockport, N. Y., Hon. Albert D. Bosson, of Boston, was elected a Director and President to fill the vacancy caused by the death of the late President Beverley. Mr. Bosson is President of the Winnisimmet Savings Bank, and formerly Vice-President of the company. Mr. Frank Gebbie, Manager of the Mohawk Condensed Milk Co., of St. Johnsville, was elected Vice-President. The report of the Treasurer showed that the finances were in a satisfactory condition. Both the factories at Lockport and Boston are running about as usual and the company is in receipt of a large number of orders, but these are usually small in amount. The stock of goods on hand is now much larger than was ever before carried, so that telegraphic and other urgent orders can be promptly filled.

Owing to the increased demand upon its hardening and annealing department, the Brown & Sharpe Mfg. Co. has recently erected a building which is entirely devoted to that branch of its business. This will give the company special facilities for hardening dies, punches and other tools.

The stockholders of the Westinghouse Machine Co. have decided to increase the capital stock from $750,000 to $1,500,000. This move will be taken in connection with the development and manufacture of gas engines.

The Chickamauga Coal and Iron Co., of Chickamauga, Ga., has decided to build 200 coke ovens at its mines, to cost $100,000. The plan is, ultimately, to coke the entire output of coal (1,000 tons daily), and it will probably be necessary to add 600 additional ovens.

The Edwards Car Coupler Co., of Troy, was incorporated on September 18, in New York. The capital is $500,000 and the directors are Richard J. Edwards, of Galena, Ill.; Charles E. Lewis, of Philadelphia; John A. Macdonald, of Troy; Merton A. Holbridge and Lyman P. Wood, of Green Island, and Howard C. North, of Watervliet.

The Totten & Hogg Iron and Steel Foundry Co., of Pittsburgh, has recently received orders for a shipment of iron and steel gear-wheels, and shafting, to Africa The company has a number of orders ahead for rolls and other machinery.

The Trojan Car Coupler Co. is receiving orders in large quantities for its locomotive couplers, which are provided with lateral play and means for bringing the coupler to the center by gravity. The provision for lateral play dispenses with the use of springs. The Trojan Co. is also selling its new continuous platform with or without an equalizer, which can be used with the Miller platform, and also the McKeen carry-irons providing for lateral play for passenger and freight couplers.

Iron and Steel.

The Bristol iron furnace, Bristol, Va., which has been idle for four years because of complicated litigation, has been ordered sold, the sale to take place Nov. 14.

The Edgar Thomson Steel Works, of the Carnegie Co., employing 2,000 men, resumed operations on Sept. 21, after an idleness of several weeks. The plant is expected to run steadily.

On Sept. 11 the Indiana Steel Casting Co. Montpelier, Ind., passed into the hands of Receivers, Messrs. T. C. Neal, of Montpelier, and Oscar L. Baker, of Cleveland, being appointed. The failure was caused by a mechanic's lien of $13,500, held by a Cleveland firm.

A meeting of the directors of the Mahoning Valley Iron Co. was recently held at Youngstown, O., to complete the organization of the company inaugurated two months ago by the election of George D. Wick as President. The officers of the company are now as follows: President, George D. Wick; Vice-President, Edmund L. Brown; Secretary, Harry Bonnell, and Treasurer, William F. Bonnell. Extensive improvements and additions are to be made to the plant, and the manufacture of additional new products will probably be taken up.

The billet and converter departments of the Illinois Steel Co., Joliet, Ill., after a shut-down lasting nearly two months, resumed operations on Sept. 15, giving employment to 2,000 men. The company has a large number of orders on hand, and a steady run of at least several months is looked for.

The directors of the Illinois Steel Co. have passed the September quarterly dividend, owing to lack of demand for the company's product. It was thought poor policy to pay dividends with the furnaces shut down, although the company's financial condition is good.

The capacity of the new Buhl steel mill at Sharon, Pa., is to be increased and as a result the capital stock of $300,000 will be raised to $600,000.

New Stations and Shops. The new car building and repair shop of the Brooklyn Heights Street Railroad, at Fifty-second street and Second avenue, Brooklyn, is nearly completed. The building is two stories, 350 ft. × 100 ft. On the first floor is the stock-room, the planing, turning and carpenter shops, and the offices of the Superintendent. The building contains an electric elevator, 40 ft. long, to be used in lifting cars to the second story.

The new car works of the Buffalo, Rochester & Pittsburgh, at Du Bois, Pa., are rapidly nearing completion. The oil house, store house and lumber shed have been finished, and the blacksmith shop and mill nearly so. Work on the erecting shop is being pushed rapidly, and it is expected that it will be ready for the machinery within two weeks. Most of the machinery has been delivered. The ground about the buildings has been filled to the required extent.

Physical Properties of Open-Hearth Castings. We give below a record of tests on open-hearth cast steel made by the Sargent Company, of Chicago. The results of the tests show a high grade of steel, and the Sargent Company calls attention to the fact that the castings were made as far west as Chicago, claims having been made that satisfactory steel castings can be obtained only in the East. The Sargent Company has received from the Charles F. Elmes Engineering Works a letter commending these castings.

Heat No.	Tensile strength per square inch.	Per cent. elongation in 8 in.	Reduction of area.
E 138.....	67,800	22.5	41.5
E 141.....	60,200	24.8	46.6
E 142.....	64,700	23.3	44.7
E 144.....	59,300	24.8	46.9
E 149.....	60,500	26.2	45.4
E 154.....	62,200	25.5	52.5

Electric Switching Locomotive for Baltimore & Ohio.

The Baltimore & Ohio has recently ordered from the General Electric Co. an electric switching engine which will weigh 16 tons. The engine will have a speed of about 7½ miles an hour, and will exert a drawbar pull of 2,500 lbs. It will have four 30-in. wheels and will be equipped with the standard General Electric Co.'s "K" type, series parallel commutator, two G. E. 1,000 motors. It will have an ordinary trolley pole, and will be inclosed, the dimensions over all being 12½ ft. × 6½ ft.

Paint for Ironwork.

The *Deutsches Bauzeitung* gives an account of the researches made by Prof. J. Spenrath, in regard to the value of different kinds of paint for ironwork. One conclusion reached is that none of the metallic oxides commonly used combine chemically with linseed oil; the

drying process depends on an absorption of oxygen by the oil, and is helped by the presence of the pigment in a mechanical way only. The value of the different pigments used varies widely. Zinc white swells to double its original volume, owing to the absorption of carbonic acid gas and water. Sulphuretted hydrogen causes the same effect in red or white lead, but when pure these latter pigments are found to be very satisfactory. Carbon paints and heavy spar are both very stable. Tests showed that dilute nitric or hydrochloric acid and vapors of sulphuric and acetic acids had a very great destroying action. Some alkaline fluids and gases were also found to have the same effect. Pure water was found to be more injurious than salt water, therefore the destroying action of sea water is attributed mainly to the mechanical effects of wash. Hot water acts more rapidly than cold. It was found that films of paint completely lost their elasticity and became brittle when exposed to a temperature of 203 deg. F., and at the same time showed a large contraction.

Re-Opening of the Wells Street Bridge, Chicago.

The Wells Street bridge, Chicago, was opened to traffic Sept. 18, after being closed since July 3. The structure has been rebuilt by the Northwestern Elevated Railroad at an expense of $25,000, the old bridge not being of sufficient strength to permit of its use by the elevated trains. A new turntable has been put in and electric power is now used in turning the bridge.

Graphite Used in Paint.

The Detroit Graphite Manufacturing Company, of Detroit, Mich., is calling the attention of engineers and architects to the superior graphite brand of paint which it makes. The material which gives the body to this paint is the non-corrosive, non-oxidizing and indestructible element graphite. The particles of graphite are held in an oil free from all acids, and which when it dries cements the particles tightly together and at the same time to the article receiving the paint. The possession by the paint of non-corrosive and non-oxidizing properties makes it specially desirable for use on iron and steel work. The paint itself offers a marked resistance to the corrosive action of acids and alkalies, as has been shown by many experimental tests, all of which were much more severe than any that will be met with in ordinary use. This resistance makes it valuable as a priming coat on iron work where a fancy color is desired, as it prevents the acid of the top coat from reaching the iron; or as a protection to iron tanks, when used to hold solutions containing acids or alkalies. In regard to the effect of heat upon the paint, it has satisfactorily undergone many tests of this kind without the least signs of blistering or cracking. It has stood well on bridges and the underside of roofs where it has been constantly exposed to the heat and corrosive fumes of locomotives passing or standing beneath. For places where the heat is known to be intense, such as on smokestacks, boilers, etc., the company makes a specially prepared black, glossy paint. The waterproof and elastic properties of superior graphite paint are of a high degree, thus making it well suited for the protection of the hidden and inaccessible structural metal work of fireproof buildings; the waterproofing protecting the metals from the moisture of the bricks and stone, and the elasticity allowing an expansion and contraction of the metal without cracking the paint. The paint in its natural state is a dark slate, but other colors such as dark olive green, black, brown and red are also made. It can be used in any place where a strong, durable paint is desired; and one gallon will cover from 500 to 800 sq. ft., depending on the surface.

Bids for New Torpedo Boats.

On Sept. 18, bids were opened at the Navy Department, Washington, for the 13 torpedo boats authorized by the last session of Congress. For three of these vessels, the requirements called for a speed of 30 knots, the plans to be drawn up by the builders. For the other 10, the department asked bids for two separate types, for one of which, plans were supplied involving approximately 105 ft. length, 12½ ft. beam, 4½ ft. main draft, 68 tons displacement, 850 H. P., and 20 knots speed, armed with two single-deck torpedo guns and one one-pounder rapid-fire rifle; on plans of their own, builders were invited to propose 22½-knot boats, to be about 140 ft. long, of 150 tons displacement, and 1,700 H. P. The appropriation is $1,300,000, of which $800,000 is allowed for the 30-knot boats. The bids were opened by Assistant Judge-Advocate General Lanchheimer and were as follows for the 30-knot boats: Union Iron Works, San Francisco, one at $227,500; Bath Iron Works, Bath, Me., two at $194,000 each and three at $189,000 each, also two at $225,000 each; Herreshoff Co., one at $218,000 and three at $206,000 each; J. H. Dialogue & Son, Camden, N J., one at $260,000 and two at $255,000 each. Bids were received for the smaller boats from nine firms. Many of the companies made combination proposals for two of one class and one of another, and some bidders furnished various designs, which will be carefully examined by the bureau engineers before any award is made. It was remarkable that no bids were received except from coast builders, and that so few companies competed.

Long-Burning Arc-Lamps.

The General Electric Co. recently issued an illustrated pamphlet describing its 100-hour and 150-hour, long-burning arc-lamps. The figures given show a large saving in cost of carbon renewals. Any one using 100 arc-lights would be able to save $804 a year by introducing the General Electric Company's 150-hour lamps, the saving in carbons alone being $520, and the saving in wages of a trimmer, $284. If the average run throughout the year on commercial circuits is four hours, a lamp which gives 150 hours of continuous service will need trimming but eight times a year.

THE SCRAP HEAP.

Notes.

The telegraph lines on the Chesapeake, Ohio & Southwestern and the Yazoo & Mississippi Valley roads are now operated by the Postal Telegraph Company, the contracts with the Western Union having expired. Both of these roads are controlled by the Illinois Central.

About 6,000 railroad employees from Chicago and vicinity went to Canton, O., on Saturday of last week to pay their respects to the Republican Presidential nominee. They went by the Pittsburgh, Fort Wayne & Chicago, occupying 108 cars. The party was made up from all of the 21 railroads centering in Chicago, the space in the train being allotted in proportion to the relative size of the parties from the different roads, the accommodations being insufficient for all who desired to go.

The decision of the New Jersey Court of Chancery, several months ago, that the Pennsylvania Railroad was in contempt for not obeying an injunction issued in connection with the crossing war at Shanly's Cut, Jersey City, has been reversed by the Court of Errors, the decision being prepared by Chief Justice Beasley. The Pennsylvania Railroad lawyers argued that, as they appealed the decision of the Chancellor to the Court of Errors and Appeals, all that the Dock Company sought to gain was stayed by the appeal, and the Pennsylvania was not in contempt. The Chancellor, however, found that it was in contempt and this was also appealed. In reversing the Chancellor, the Chief Justice sustains the position of the appellant that it had a right to disregard the injunction, because by an appeal taken in the case the mandate of the Court has been absolutely suspended. The Chief Justice says that while the practice adopted by the Chancellor was the practice of the Chancery Court, yet it has only prevailed in said court and cannot have the sanction of the court of last resort.

A Lake Record Broken.

The whaleback Christopher Columbus made its last trip from Chicago to Milwaukee, Sept. 8, before going into winter quarters. The distance from Chicago to Milwaukee is 84 miles from pier to pier, and was made in 4 hours and 2 minutes, or at an average rate of 21 miles per hour. The distance from Milwaukee light to Wind Point light, 21 miles, was made in 54 minutes, at the rate of 23.33 miles per hour. This establishes a new record between the points named.

Brown's Discipline on the Rock Island.

The management of the Chicago, Rock Island & Pacific announces by circular to the employees a change in discipline, adopting the plan similar to that now in force on many other roads, known as the Fall Brook System. The circular says, in part:

"With a view of reducing suspensions and at the same time of disciplining employees, on their individual performance, a record will be kept of each employee, showing his shortcomings, etc., and at the same time a similar record of commendable service, economical performance, excellent conduct, valuable suggestions, and all exceptionally good acts which go to establish the record of a first class, conscientious employee.

"Employees will, as heretofore, be discharged for drunkenness (either on or off duty); for drinking intoxicating liquors on duty; for frequenting saloons or other places of low resort; for incompetency, dishonesty and insubordination; and for other serious offenses

"Demerit marks will be assessed in each case, one mark representing one day's suspension under the former system, except that for a repetition of the same offense additional demerit marks may be assessed. Each person will be entitled to 65 demerit marks before dismissal. For every 12 consecutive months' perfect service, free from demerit marks, a credit of 20 marks will be given to each employee. No credit will be allowed for less than 12 consecutive months' service.

". . . All employees affected by this rule start with a clean record on Oct. 1, except that when subsequent records shall show that past offenses are being repeated, the persons concerned may be summarily dealt with, or given double marks, as the case may merit."

Lake Notes.

The shipyard of the Steel Barge Co., at Superior, has repaired 46 ships during the closing season.

Many large ships of the lakes are being laid up for the winter and stripped, because of low freights.

In one day last week 40,100 tons of iron ore were cleared at Duluth, the greatest record made there. Of the total, 22,000 tons were taken by three of the Bessemer Company's new ships and one other. Of the remaining 10 cargoes of the day 7 were over 2,000 tons each, the figures showing the growth of lake ships. The cargo of the Bessemer that day was 4,172 gross, or 4,672 net tons, breaking all ore records. On the same day the Queen City took from Duluth 157,000 bu. of wheat, or 4,710 tons.

The season of the two express passenger steamships of the Great Northern road, North West and North Land, has closed and both ships are laid up in Duluth. The newspaper reports that one vessel made 25 per cent. profit are doubtless greatly exaggerated, though the vessel may have made money, having carried as high as 550 passengers on a trip. Both boats did as good a business as could be expected for the year, and prospects for next year are bright. The North Land had made the remarkable record, for a ship that has gone up and down the lakes and connecting channels at express speed all summer, of receiving no injury beyond the breaking of a wheel on the last regular trip, but the vessel was sunk in her slip at Duluth on Sept. 21. Reports state that this was probably done by a discharged employe. The Belleville boilers of the North West have not proved satisfactory and will be taken out this winter

Lake Street Elevated Again Using Electricity.

The change from steam to electricity as motive power on the Lake Street Elevated road in Chicago was made Sept. 19. Since the accident of June 20, when a motor car left the structure, the use of electricity had been discontinued. Meantime the motor cars have been refitted with trucks made by the Baldwin Locomotive Works, and equipped with the Westinghouse air-brake. Considerable work has also been done on the track, which is now in good condition. Thirty-seven new motor cars are now being used and the 35 steam engines which have been used will be disposed of. By the new schedule trains will be run at intervals of three minutes from 6:50 until 8:06 a. m., and from 4:36 to 6:07 p. m. From 8:06 a. m. to 9:26 a. m. trains will be four minutes apart. Trains will be 7 minutes apart after 8:02 p. m., and the midnight schedule will remain unchanged.

LOCOMOTIVE BUILDING.

The Baldwin Locomotive Works, of Philadelphia, have been given a contract for eight locomotives for the Imperial Railway of China.

The Atchinson, Topeka & Santa Fe is building at its shops in Topeka, Kan., an eight-wheel locomotive for service on the Topeka and Kansas City express trains. The engine is being designed especially for speed, with the view of reducing the train time between those two cities. It will be No. 151, and will have cylinders of 17 in. × 24 in., with driving wheels 63 in. in diameter over tires. It is expected to be finished within a very few days.

CAR BUILDING.

The second order for the equipment of 50 Canadian Pacific stockcars with the Westinghouse air-brake and automatic couplers has just been completed in the car shops at Montreal.

The sale of the property of the Harrisburg Car Manufacturing Co, which had been announced to take place at Harrisburg on Sept. 22, has been indefinitely postponed, at the request of the unsecured creditors who believed that the sale of the property under existing business conditions would not bring a reasonable price.

The passenger rolling stock for the San Francisco & San Joaquin Valley has arrived at Stockton, Cal, and also cabooses for freight trains. There are six passenger coaches, two combination baggage and smoking cars and eight cabooses in the consignment. The passenger coaches are painted a bright yellow and their trimings are of aluminum.

The Brooklyn Heights Railroad Company has ordered 50 new cars, to be completed for fall and winter travel. Thirty-five of the cars were ordered from Barney & Smith, of Dayton, O., and 15 from the New York Supply Co. The cars have a number of improvements over those now in use. Instead of opening at the ends, the door is on the side. In the interior are two rows of cane spring seats, which will seat 32 passengers. The aisle is almost as wide again as the ordinary street-car aisle. The finishings of the doors and windows are in varnished oak. The windows are stationary, ventilation being by overhead screens. Instead of the usual overhead bell cord signals, electric bell signals are provided for each seat. The cars are, of course, lighted by electricity. Another improvement is the Woods safety gate, which is worked by a lever, and is so arranged that the passenger cannot open it. The length of the cars is 35 ft., considerably longer than the cars now in use.

BRIDGE BUILDING.

Baltimore, Md.—An ordinance has been introduced in Council and referred to the Committee on City Passenger Railroads, to permit the Lake Roland Elevated Railway to erect a double-track iron bridge over the Windsor Mill road.

Bloomsburg, Pa.—The contract for the superstructure of a 50-ft. iron bridge, over Little Fishing Creek, has been awarded to the King Bridge Co., at $900 Other bidders were: Nelson & Buchannan, Chambersburg, Pa., $940; Berlin Iron Bridge Co., $960.

Cargill, Ont.—Messrs. Hunter Bros., of Kincardine, have been awarded the contract for a steel bridge over the Yokasipi River.

Duluth, Minn.—Bids are asked Oct. 6 for building four bridges. O. Halden, County Auditor.

Ellwood City, Pa.—The Commissioners of Lawrence County have let the contract for the cantilever bridge to span the Conoquenessing River at this place to Nelson & Buchannan, Chambersburg, Pa. It will be 468 ft. long, roadway 24 ft. wide, and two sidewalks 5 ft. wide.

Hillsboro, N. Dak.—The contract for county bridges has been given to the Wrought Iron Bridge Co., Canton, O., at $9,395. Gillette-Herzog Mfg. Co., Minneapolis, Wis., bid $9,939; S. M. Hewett, Minneapolis, $10,050; L. H. Johnson, Minneapolis, $10,000; Milwaukee (Wis.) Bridge and Iron Works, $9,592.

Leavenworth, Kan.—Reports state that bids are asked until Oct. 5 for two county bridges. J. W. Niehaus is County Clerk.

Meadville, Pa.—The Grand Jury has recommended the building of a county bridge over Oil Creek at the foot of Brown street.

Milwaukee, Wis.—Press reports state that the Chicago & North Western is to build a new double-track bridge on the Chicago Division across the Kinnickinnic River. An ordinance to permit the railroad to build a temporary bridge to serve while the new bridge is being erected has been introduced in the Common Council and is now before the committees on bridges and harbors and the City Engineer.

Mountain View, N. J.—The contract for the iron work of the two-span bridge over the Pequannock River at this place has been awarded to the Canton (O.) Bridge Co.

Newark, N. J.—The Joint Committee of the Boards of Chosen Freeholders of Hudson and Essex counties will receive bids until Sept. 30 for a highway bridge over the Passaic River between Jackson street, this city, and Fourth street, Harrison. Particulars may be obtained and plans may be seen at the office of the Committee on Roads and Assessments, 800 Broad street.

New Brighton, Pa.—The viewers appointed by the court have decided to recommend to the Grand Jury the rebuilding of the Black House Run bridge.

Oregon, Ill.—The Ogle County Supervisors have voted $12,000 toward building a new steel bridge across Rock River at this place.

Philadelphia, Pa.—It is reported that the Engineer of Bridges of the Pennsylvania Railroad is preparing the plan for a 10-span steel viaduct on the Phœnixville branch, near Chickering Valley station.

Toronto, Ont.—A new steel bridge is to be built over the Etobicoke River, at Burnhamthorpe, between the counties of Peel and York, for which tenders will be invited at once. The estimated cost is $2,000.

Torrington, Conn.—Bids for the new bridge at the junction of Main and South Main streets and crossing the Naugatuck River have been opened. The Berlin Iron Bridge Co. made the lowest and successful bid of $6,895.

Winton, N. C.—Bids are asked by G. W. Hinshaw, of this place, for an iron and steel bridge, 130 ft. long, with stone abutments, to be built across the Little Yadkin River, near Wilkesboro.

Winnipeg, Man.—The Manitoba Government engineers have located sites for steel bridges over the Pembina and Souris Rivers.

Woonsocket, R. I.—The ordinance appropriating $21,500 for the River street bridge has been passed in concurrence.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Cleveland, Cincinnati, Chicago & St. Louis. quarterly, 1¼ per cent. on preferred stock, payable Oct. 1.

Chicago & Eastern Illinois, quarterly, 1½ per cent., payable Oct. 1.

Evansville & Terre Haute, 1 per cent. on preferred stock, payable Oct. 15.

Keokuk & Western, semi-annual, 1 per cent., payable Oct. 1.

Manhattan, quarterly, 1¼ per cent., payable Oct. 1.

Norfolk & Southern, quarterly, 1 per cent, payable Oct. 10.

Pittsburgh, Youngstown & Ashtabula, 3 per cent. on common stock and 3½ per cent. on preferred stock, payable Sept. 25.

Sunbury & Lewiston, semi-annual, 4 per cent., payable Oct. 1.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Alabama Great Southern, annual, Birmingham, Ala., Oct. 7.

Bangor & Aroostook, annual, Bangor, Me., Oct. 20.

Boston & Maine, annual, Lawrence, Mass., Oct. 14.

Fitchburg, annual, company's office, Boston, Mass., Sept. 30.

Great Northern, annual, St. Paul, Minn., Oct. 8.

Illinois Central, annual, Chicago, Ill., Oct 14.

Lake Erie & Western, annual, Peoria, Ill., Oct. 7.

Louisville & Nashville, annual, Louisville, Ky., Oct. 7.

Maine Central, annual, Portland, Me., Oct. 21.

New York, New Haven & Hartford, annual, New Haven, Conn., Oct. 14.

New York, Ontario & Western, annual, New York, N. Y., Sept. 30.

Northern Pacific, annual, New York, N. Y., Oct. 15.

Peoria, Decatur & Evansville, annual, Pekin, Ill., Oct. 6.

St. Louis Southwestern, annual, St. Louis, Mo., Oct. 6.

St. Paul & Duluth, annual, St. Paul, Minn., Oct. 13.

St. Paul, Minneapolis & Manitoba, annual, St. Paul, Minn., Oct. 8.

Seaboard & Roanoke, annual, Portsmouth, Va., Oct. 6.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *American Street Railway Association* will hold its annual convention at the Southern Hotel, St. Louis on Oct. 20–23.

The *American Institute of Mining Engineers* will hold its annual meeting in Denver, Col., beginning on Sept. 21. For provisional programme see issue of July 24, page 530.

The *Travelling Passenger Agents' Association* will hold its next annual convention at St. Louis, Mo., beginning Sept. 29.

The *American Railway Association* will hold its next annual convention at the Hoffman House, New York City, Oct. 7.

The *Freight Claim Association* will hold its next annual convention at The Jefferson, Richmond, Va., beginning Oct. 7.

The *Association of Railway Superintendents of Bridges and Buildings* will hold its annual meeting at Chicago on Oct. 20. For programme see issue of Aug. 7, page 560.

The *Railway Signalling Club* will meet on the second Tuesday of the months of January, March, May, September and November, in Chicago.

The *Western Railway Club* meets in Chicago on the third Tuesday of each month, at 2 p. m.

The *New York Railroad Club* meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m., except in June, July and August.

The *New England Railroad Club* meets at Wesleyan Hall, Bromfield street, Boston, Mass., on the second Tuesday of each month.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, N. Y., on the second Friday of January, March May, September and November, at 2 p. m.

The *Southern and Southwestern Railway Club* meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November.

The *Northwestern Railroad Club* meets at the Ryan Hotel, St. Paul, on the second Tuesday of each month, at 8 p. m.

The *Northwestern Track and Bridge Association* meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2.30 p. m.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month, at 8 p. m.

The *Western Society of Engineers* meets in its rooms on the first Wednesday of each month, at 8 p. m., to hear reports, and for the reading and discussion of papers. The headquarters of the Society are at 1736–739 Monadnock Block, Chicago.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m., except during July and August.

The *Boston Society of Civil Engineers* meets at 715 Tremont Temple, Boston, on the third Wednesday in each month, at 7:30 p. m.

The *Engineers' Club of St. Louis* meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St. Louis, on the first and third Wednesdays in each month.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The *Engineers' Society of Western Pennsylvania* meets at 410 Penn avenue, Pittsburgh, Pa., on the third Tuesday in each month, at 7:30 p. m.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Association of Engineers of Virginia* holds informal meetings on the third Wednesday of each month, from September to May, inclusive, at 710 Terry Building, Roanoke, at p. m.

The *Denver Society of Civil Engineers* meets at 3 Jacobson Block, Denver, Col., on the second Tuesday of each month except during July and August.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7.30 p. m.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday, at 8 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati, O., on the third Thursday in each month, at 7.30 p. m. Address P. O. Box 333.

The *Engineers' and Architects' Club of Louisville* meets in the Norton Building, Fourth avenue and Jefferson street, on the second Thursday each month at 8 p. m.

The *Western Foundrymen's Association* meets in the Great Northern Hotel, Chicago, on the third Wednesday of each month. S. T. Johnston, Monadnock Block, Chicago, is secretary.

The *Engineers' Club of Columbus, (O.)*, meets at 12½ North High street, on the first and third Saturdays from September to June.

The *Engineers' and Architects' Association of Southern California* meets each third Wednesday of the month in the Hall of the Chamber of Commerce, Los Angeles, Cal.

The *Engineers' Society of Western New York* holds regular meetings the first Monday in each month, except in the months of July and August, at the Buffalo Library Building.

The *Civil Engineers' Society of St. Paul* meets on the first Monday of each month, except June, July, August and September.

The *Engineers' Society of Western New York* meets on the first Monday of each month at the Society's rooms in the Buffalo Library.

The Texas Railway Club.

A session of the Texas Association for the Interchange of Cars was held at Galveston, Sept. 8. Rating locomotives by tonnage basis was the topic for discussion. It was decided to change the name of the association to the Texas Railway Club. The annual meeting will be held at San Antonio the first Monday in April.

St. Louis Railway Club.

A meeting of the St. Louis Railway Club was held in the parlors of the Southern Hotel, St. Louis, last week. Papers by J. W. Stokes, Master Mechanic Illinois Central Railroad, East St. Louis, Ill., entitled "The Use of Malleable Iron and Pressed Steel in Car Construction," and William Gibson, Superintendent Big Four Railway, Springfield, O., entitled "Railroad Labor Organizations from an Every-Day Standpoint," were read.

Society of Naval Architects and Marine Engineers.

The third general meeting of the society will take place in New York City, at 10 a. m., Thursday, Nov. 12. The meetings will be held in the rooms of the American Society of Mechanical Engineers, No. 12 West 31st street, the sessions continuing through Thursday and Friday, Nov. 12 and 13. There will be a banquet, of which subsequent notice will be given, Friday, Nov. 13. The usual notice giving assignment of papers will be issued about Nov. 1.

American Society of Irrigation Engineers.

The annual meeting of this society will be held in Denver, Dec. 11 and 12, closing in time to reach Phœnix for the opening of the International Irrigation Congress, on the 15th of that month. At the Denver meeting, State Engineer Mead, of Wyoming, will present a paper on "Land Laws for Arid Region." "Pipes vs. Flumes" will be another principal subject. These papers will be printed and distributed in advance for discussion. A circular will shortly be issued giving full particulars. Mr. J. S. Titcomb, of Denver, is Secretary and Treasurer of the society.

General Passenger Agents' Association.

The American Association of General Passenger and Ticket Agents met at Atlantic City Sept. 17. The only subject discussed at length was the report of the committee which has been considering the question of adopting a distinctive paper for tickets, with a view to the prevention of counterfeits. No decisive action was taken, but the committee was instructed to confer with the traffic associations, which have authority to act for the several railroad companies, with a view to further negotiations with the printers who propose to supply the railroads with tickets printed on distinctive paper. The extent to which the printers will bind themselves to protect the railroads from the use of the adopted paper by unauthorized parties is a matter which has not yet been settled. Hereafter the association will meet annually instead of semi-annually, St. Louis being selected as the place of meeting in October, 1897.

Meeting and Banquet of the Western Railway Club.

The September meeting of the Western Railway Club was held Sept. 15, at the Auditorium Hotel, Chicago.

The paper by Mr. D. L. Barnes, entitled "Relation of Steam to Power and Efficiency of Electric Motors for Locomotives," was discussed with a view especially to the relative ranges of efficient working of locomotives and electric motors. The next subject taken up was the paper presented at the May meeting by Prof. W. F. M. Goss, entitled "Some Notes on the Performances of the Purdue Locomotive 'Schenectady.'" The question of the capacity of locomotives was discussed, Mr. E. M. Herr presenting some results obtained from engines on the Chicago & Northwestern testing plant.

President Waitt announced that some difficulties had arisen under the new interchange rules of the Master Car Builders' Association, and a committee was appointed to consider the questions and make suggestions at the next meeting.

The next subject was "Difficulties with the Use of Metal Underframing for Tenders and Cars," and was discussed by a number of members. A paper entitled "The Apprentice Boy," was read by Mr. J. N. Barr.

The fourth annual banquet was held in the evening, after the close of the business meeting. President Waitt made an appropriate address, "Our Club," referring to the progress of the Railway Club and the valuable work done in the past. Mr. H. G. Prout, of the *Railroad Gazette*, New York, responded to the toast, "The Press," calling attention to the growing professional spirit manifested by railroad officers and the part which the railroad press had taken in bringing about this important improvement.

The other speakers were President J. H. Smart, of Purdue University; Mr. J. H. P. Hughart, Second Vice-President of the Grand Rapids & Indiana; Mr. M. C. Markham, Assistant Traffic Manager, Illinois Central; Mr. F. W. Morse, Superintendent of Motive Power, Grand Trunk; Mr. H. C. Buhoup and Mr. George H. Heafford. The banquet hall was beautifully decorated. The number in attendance was 98. The bill of fare was arranged in the form of a timetable.

PERSONAL.

—Mr. F. F. Graf has been appointed Receiver of the Ohio Southern Railroad in place of Mr. J. R. Megrue, resigned.

—Mr. Edward W. Hines, General Agent of the Ohio Southern, has been appointed Assistant General Passenger Agent of the Lima Northern.

—Mr. Osborne B. Stone has been appointed Superintendent of the Nashville & Suburban Railway Co., to succeed Mr. J. W. Kean, resigned.

—Mr. F. L. Sheppard, Superintendent of the Pennsylvania, has assumed charge of his office in Altoona, Pa., after an absence of five months necessitated by the state of his health.

—Mr. William Gibson, Superintendent of the Cincinnati, Columbus and Sandusky divisions of the Big Four, has been appointed Assistant General Manager of the Baltimore & Ohio.

—Mr. R. B. Gemmell, Superintendent of Telegraph of the Atchison, Topeka & Santa Fe, died at Topeka, Kan., on September 14. Mr. Gemmel had been with the company for many years.

—Mr. D. E. McMillan, General Freight Agent of the Columbus, Sandusky & Hocking, has resigned and will enter the coal business with J. W. Ellsworth, with headquarters at Cleveland.

—Mr. E. F. Ingles, the locomotive engineman who shot and killed a train robber at Websters, Cal., Sept. 5, has been presented with a gold watch and chain by the Southern Pacific Company. Manager Fillmore also handed the engineer a check for $250.

—Mr. H. F. Moeller, formerly District Passenger Agent of the Flint & Pere Marquette, at Detroit, has been promoted to the position of Assistant General Passenger Agent of the same road, with headquarters at Saginaw, Mich. Mr. Moeller has been connected with the road for 14 years, in the traffic department.

—Mr. M. H. Hurley, recently Passenger Agent of the Midland Railway of England, has resigned that office, and is now associated with the tourist firm of Mr. Frank C. Clark, No. 111 Broadway, New York City, and will act in the capacity of Passenger Agent for the Great Northern, North Eastern, North British and Great Western railways of England. Mr. Clark is General Passenger Agent in the United States for those lines.

ELECTIONS AND APPOINTMENTS.

Chicago, Milwaukee & St. Paul.—At the annual meeting of the stockholders, held in Milwaukee, Wis., on September 19, the directors and officers whose terms had expired were re-elected.

Louisville, New Albany & Chicago.—At the annual meeting, Sept. 16, J. A. Hilton was elected to the Directory, vice S. K. Silbey, deceased. The other Directors were re-elected as follows: W. H. McDoel and Gilbert B. Shaw, Chicago; Calvin S. Brice, Lima, O.; James Murdock, Lafayette; Joseph H. Bond, Washington; E. Connor, John Greenough, Frank R. Lawrence, John G. Moore, Samuel Thomas, E. R. Thomas, New York, and H. H. Campbell, Boston.

At the annual meeting of the stockholders the directors and officers whose terms expired were unanimously re-elected. No other business was transacted.

Missouri, Kansas & Texas.—The Superintendent of transportation has been transferred from Parsons, Kan., to St. Louis. The removal involves a change of residence for twenty-five clerks.

Pennsylvania.—Bernard Courlaender, of Newark, N. J., has been made Division Passenger Agent with headquarters in Baltimore, succeeding the late S. D. Kennedy, who died recently at Atlantic City. Mr. Courlaender has been agent at Newark for five years.

Southern.—Mr. W. A. Stone, formerly Master Mechanic of the shops at Selma, Ala., has been appointed Master Mechanic of the Eighth Motive Power Division, Birmingham shops, to succeed W. L. Tracy, transferred. Mr. Stone will be succeeded at the Selma shops by Thomas M. Feeley.

RAILROAD CONSTRUCTION
Incorporations, Surveys, Etc.

Baltimore & Ohio.—L. B. McCabe & Bro., of Baltimore, have been awarded the contract for straightening and grading the line between Tabb Station and North Mountain, near Martinsburg, W. Va. The main object of this improvement is to do away with the sharp curves and heavy grades around Myers' Hole, and especially to avoid the dip in the grade at the latter place. About 125,000 yards of rock and earth will have to be removed. The improvement will cost about $50,000, and it will require about five months to finish the work. The improvement will enable freight locomotives to carry five or six more cars in a train between Cumberland and Martinsburg.

All along the route of the new Pittsburgh & Glenwood "cut-off" the work is being pushed rapidly

and large quantities of cut stone for the bridges have arrived on the grounds. It is the intention of the contractors to have the grading all completed and the masonry well under way by the first of November. This new line will greatly facilitate the movement of Baltimore & Ohio traffic in the Pittsburgh district.

Bear Harbor & Eel River.—A company was incorporated on Sept. 7 to build this road, which will extend from the junction of Indian Creek with Eel River to the terminus of the cable road operated by the Bear Harbor Lumber Co., Mendocino County, Cal., about 15 miles. The capital stock of the company is $200,000, of which $100,000 has been paid in. The incorporators are: James Hunter, Thomas Ballard, E. J. Dodge, Calvin Stewart and A. B. Cooper.

Beech Creek.—The company has awarded to George Good & Co., Lock Haven, Pa., the contract for building the extension in Cambria County. The line will be about nine miles in length. Good & Co. will commence the work at once.

Boise, Nampa & Owyhee.—Grading has been completed for a distance of nine miles out of Nampa, Idaho, and about a mile of grade has been built from Snake River toward Nampa. It is expected that the road will be completed to the river, and that considerable progress will have been made on the proposed 500-ft. steel bridge across the river before winter. The grading will probably all be finished by Oct. 1.

Chicago Great Western.—A new branch is being built from Dodge Center to Mantorville, Minn., six miles This new line has been graded and rails will be laid at once. General Manager Stickney has stated that work will be finished by Oct. 15, when a local train will be put in service.

Confluence & Oakland.—Rumors of the extension of this road to Oakland, Md., are again extensively circulated. The road at present extends from Confluence, Pa., to Manor Lands, in the extreme western part of Maryland, a distance of 22 miles. The extension to Oakland would be 25 miles, connecting at that point with the main line of the Baltimore & Ohio. This will open up about 10,000 acres of timber land lying between Confluence and Oakland, and will give Pittsburgh a short line into Maryland and West Virginia. The line will be narrow gage, and part of the road has already been completed. It is expected that it will be finished before next summer.

Elgin, Joliet & Eastern.—The officers state that the extension to Whiting, Ind., is being rapidly pushed forward, and will be completed next month. This extension will reach the refineries of the Standard Oil Company at Whiting, and it is expected will add materially to the income of the company.

Erie & Eastern.—The company which has been organized to build a new railroad from Erie to Cambridge, Pa., recently held a meeting at Erie. The capital stock of the road was placed at $250,000, and divided into 5,000 shares at $50 per share. The estimated cost of the proposed road, including depots, right of way, etc., in 1876 was $444,904, or an average cost of $16,814.55 per mile; at the present time it can be built for 60 per cent. of that amount. There are several hundred business men interested, and it is thought that each one will take one or more shares. It is proposed to obtain possession of the Titusville, Cambridge & Lake Erie, which is now graded from a point three miles east of Edinboro to within one mile of Tidioute, with track laid on a part of the line.

Great Northern.—Operations are to begin shortly on the extension of this road, from Halstad to Crookston, 33 miles. Foley Bros. & Guthrie have the contract. The track-laying will be done by machinery, and it is expected the work will be finished in 30 days.

Kansas City & Omaha.—Articles of incorporation of this road have been filed with the Secretary of State of Nebraska. The incorporators are W. R. Kelly, Frank W. Hills, W. J. Carroll, Erastus Young, and Frank D. Brown. The capital stock is $3,000,000. The duration of the corporation is 50 years. The new company proposes to run its lines from Fairfield, Clay County, Neb., its principal place of business. The line is to be 170 miles long.

Kansas City, Shreveport & Gulf.—Work on the southern extension is progressing rapidly, and the entire road, both the main line and the Beaumont branch, is located except through the corporate limits of Lake Charles. Work is actively progressing from Lake Charles north, and within 10 days the entire 35 miles north to Edgewood will be under way. It is hoped that all grading will be done and ties laid by Nov. 15. There are no grades of over one per cent. and no curves sharper than six degrees, except in Vernon parish, La. The contracts are let to Quigley & Co., L. C. Corrigan and L. P. Smith.

Lehigh Valley.—On October 15, the company expects to begin regular train service over its new Depew branch. This line is about 10 miles long and extends from the main line at Depew, near Buffalo, to a point on the New York Central line near North Tonawanda; it is now practically built, and all that is required is the ballasting of the track. This branch will do away with running trains over several miles of the New York Central's tracks, and will make a great saving for the Lehigh Valley. It will also give means for operating a local service between Buffalo and Suspension Bridge, and arrangements to that effect are now being made.

Manitoba & Lake Dauphin.—Eight contractors are now at work on the line, each with a large force of men. Contractor McArthur's force, which is farthest to the northwest, is grading about 75 miles from Gladstone on the borders of the Dauphin district. The bridge building force has completed the bridge over the Grass River and moved about eight miles further north. The tracklayers are beyond the Jumping Deer River and trains are running from Gladstone to the end of the line with supplies.

Newfoundland.—Work on this road is being pushed rapidly by Contractor R. G. Reid, and the roadbed is now completed beyond Bay St. George. Over 3,000 men are employed on the work, and it is expected that rails will be laid to Port au Basque before the end of the year. This is the nearest point to Cape Breton, and will be the western terminus of the railway system.

New Roads.—A company has been formed and papers of incorporation were filed at Annapolis, Md., on Sept. 8, to build and operate a road in Jarrett County, Md. The proposed line is from a point on the Maryland state line on the right bank of the North Branch of the Potomac Run, opposite or near the mouth of "Glade river," in Garrett County, Md., thence by the most practical route northerly through Garrett County to the Pennsylvania state line. Lateral branches are also provided for. The capital stock is placed at $500,000, divided into shares of $50 each. George S. Rees, of West Virginia; Andrew B. Shaw, Merritt Wilson, William McCulloch Brown and Edward H. Sincell, of Maryland, are named as incorporators.

North Shore.—A company has recently been organized to build this road, which is proposed to give the manufacturers of the Beaver Valley, Western Pennsylvania, an outlet to Lake Erie, over the Butler & Pittsburgh. The new road will start at Beaver Falls, where it will connect with the Pittsburgh & Lake Erie, and with the Pittsburgh & Northwest, thence it will cross and follow the Beaver River to its mouth, thence up the Ohio River to Conway, and to Callery Junction, where it will connect with the Pittsburgh & Western, and to Glade Run, where it will connect with the Butler & Pittsburgh. The road will be 18 miles long, and double track, and the promoters expect that it will be built within a year.

Pittsburgh & Lake Erie.—Some improvements have been recently made between Rankin and Homestead, southeast of Pittsburgh. The long trestle that extended from Rankin to Keating and over into Homestead has been rebuilt to Keating. It has been filled from there to the Monongahela River, and the danger tower at Rankin moved to the river bank. The trestle there was extended from Homestead to the river and a gauntlet laid over the bridge. It will be rebuilt next year for double tracks. The improvements made cost $200,000.

Rio Grande, Sierra Madre & Pacific.—The contract for rails for this road, referred to in our issue of Sept. 4, has been awarded to the Carnegie Steel Company, and for the ties and lumber to the Reliance Lumber Company, of Beaumont, Tex.

Rio Grande Western.—The Sevier Branch has reached a point below Sevier, Utah, and construction will stop for the season at mile post 125, from Thistle Junction. The end is 185 miles from Salt Lake and within 12 miles of Marysvale. It is not determined yet when trains will run south of Elsinore, the present terminus. With the completion of work at the terminus the Western will have added 36 miles this summer to its Sevier valley branch, a new and important factor in the company's system.

Sebasticook & Moosehead.—The management of the unfinished extension of this road has been changed, and it is expected that work will be pushed rapidly by the new corporation. The former contractors will resume their contracts, on which work has been stopped for some time. It is stated that the officers of the old company will have no connection with the new management.

Tredegar Mineral.—General Manager Burke states that the surveyors are now in the field going over the route of the line in Northern Alabama. This party is in charge of E. F. Whittman, formerly of the Chattanooga Southern, and he hopes to have the surveying all completed in two months.

Washington, Annapolis & Chesapake.—The surveyors have reached Annapolis and will now proceed around the bay shore to Bay Ridge and Arundel on the bay. L. H. Hyer, of Washington, D. C., is the Chief Engineer. Among the directors are George E. Emmons, Thomas Smith and Dr. Ritchie, of Washington. Mr. Emmons is President and Mr. Smith Treasurer.

Electric Railroad Construction.

Baltimore, Md.—Rights of way through private property have been secured by the City & Suburban Railway Co. for the proposed extension of its Walbrook line from Mt. Holly to Electric Park. The line will cross the Windsor Mill road on an elevated viaduct. Construction work will begin as soon as permission has been granted to cross roads and avenues in the city limits. The road will be double-tracked and 2¼ miles long.

Birmingham, Pa.—The Birmingham Traction Co. has given the contract for the Brownville avenue line to Booth & Smith and McIwain & Ott Bros. Estimated cost, $300,000.

Bristol, Pa.—It is stated that an electric road is to be built from the Delaware River, end of Mill street, Bristol, to Fallsington, through Emile, thence to Morrisville and Trenton.

Chicago, Ill.—On Sept. 18 the North Chicago Electric Railroad Co. filed its bond and formal acceptance of the ordinance recently signed by the Mayor, giving the company the right to extend its lines on several streets in the northwestern section of the city.

Cincinnati, O.—Contracts have been let for the electric road which is to be built by the Cincinnati Street Railroad Co. on Twelfth and Walnut streets.

Dedham, Mass.—The West Roxbury & Roslindale street railroad, referred to among our construction notes July 26, has been completed, and was formally opened Sept. 18. The road extends from Forest Hills to Roslindale and other West Roxbury villages, to Germantown and to Dedham.

On Sept. 16, the Norfolk Central Street Railroad Co. began to run its cars from Dedham to Norwood, a distance of nearly five miles. The construction work on the road was completed about four weeks ago.

Hamilton, Ont.—The new radial line from Hamilton to Ancaster has been granted a free right of way through the latter municipality.

Hyattsville, Md.—As a consequence of the application for a receiver on the part of certain creditors of the Maryland & Washington Electric Railway Co., the engineering force at Hyattsville under the direction of Mr. Riley have been laid off indefinitely. The engineers believe that the receiver will undertake the resumption of work on the road, as over a million dollars has already been invested.

New York.—The application of the Third Avenue Railroad Co., for permission to change the motive power on its Kingsbridge extension from cable to electricity, was heard by the Board of State Railroad Commissioners on Sept. 21. The application was opposed by the Metropolitan Traction Co. and the Union Railway Co.

Peoria, Ill.—On Sept. 14, the Glen Oak & Prospect Heights Railroad filed its acceptance of the franchise granted by the City Council, together with its bond of $5,000 as a guarantee to faithfully carry out its contract.

Perth, Ont.—The time for beginning the construction of the electric road from Perth to Lanark has been extended one year, provided satisfactory guarantees of good faith are given by the company. The company was organized with a capital stock of $100,000 about the first of July.

Portland, Me.—On Sept. 28, a hearing will be held on the petition to grant the Portland & Cape Elizabeth Railway Co. the right to build a single track with the necessary turnouts and switches in some of the principal streets in Portland, and extending to the town line between South Portland and Cape Elizabeth.

Quebec, Que.—Our correspondent at Montreal states that a company of Quebec capitalists is being formed to obtain the franchise of Mr. Beemer and construct an electric railroad at an estimated cost of $400,000, and that it is the intention of the promoters to begin work at once with about 400 men on the Lower Town section as far as the St. Valier toll-gate. Rails are now being sent to Quebec to be laid by the Quebec Street Railway Co. on Champlain street along Dalhousie street.

Red Bank, N. J.—The amended ordinance of the Highlands, Red Bank & Long Branch Electric Railway Co., which was referred to among our construction notes May 15, provides that in the roadbed construction trap-rock stone of the size known as three inch shall be first employed to a depth of 5 in. Next, trap rock stone of the size known as two inch shall be superimposed to the depth of 2 in. That the same shall be then top-dressed with fine stone, graded, and the whole rolled to a smooth surface and all refuse, dirt and materials removed. The line was formally opened Sept. 16 from the Long Branch village line, through Eatontown, Shrewsbury and Red Bank.

Rockville, Conn.—On Sept. 19, the City Council gave a public hearing on the application of the Hartford, Manchester & Rockville Co. and the Rockville & Ellington Co. for the right to build an electric road through the streets of Rockville and to Talcottville over the Burke Hill route.

San Jose, Cal.—On Sept. 7, the Alum Rock & San Jose Railway Co. was granted permission to extend its tracks into Alum Rock Park.

Syracuse, N. Y.—The Rapid Transit Co. is pushing the work of reconstruction as rapidly as possible. We have been informed that the company will soon make application to the Common Council for electric franchises for the Fifth Ward Belt Line and the Green and Lodi street horse-car lines.

Troy, N. Y.—The contract for the 3½ miles of electric road between the lines of the Cohoes City Railway Co. and the Albany Street Railway Co. has been awarded to Larkin & Honlihan. The route will be from Cohoes through Colonie to Nineteenth street, Watervliet, and to the Congress street bridge. Transfers will be issued good from Albany to Cohoes.

GENERAL RAILROAD NEWS.

Baltimore & Ohio Southwestern.—The preliminary statement for the fiscal year ending June 30, shows the following comparisons.

	1896.	1895.	Inc or dec.
Gross earn	$6,458,395	$6,323,036	I. 135,359
Oper. exp	4,288,325	4,017,105	I. 271,220
Net earn	$2,170,070	$2,305,931	D. $135,861
Other income	9,598	2,250	I. 7,348
Total income	$2,179,668	$2,308,181	D. $128,513
Charges	2,115,779	2,096,125	I. 19,654
Surplus	$63,889	$212,056	D. $148,167

Chicago & South Side Rapid Transit.—This road was sold at auction at Chicago, Sept. 16, to Leslie Carter and George E. Adams, representing the first mortgage bondholders and the extension bondholders' Protective Committee, respectively, the price bid being $100 over the upset price of $4,000,000. Land belonging to the road was sold, the amount realized on the sale of the property being $4,100,000.

Chicago, Indiana & Eastern.—This road, extending from Fairmount to Matthews, Ind., 10 miles, has suspended operations, as stated last week, the Receiver, George B. Sweetser, finding it unprofitable to operate. The operating expenses for the last six months have exceeded the revenue, and the bondholders have advanced $3,775. There are liens for $6,000 held by Chicago firms for ties, bridge material, etc., and a considerable sum is due employees. Receiver Sweetser has petitioned for an order of sale for the rolling stock to pay the labor claims, and an order will doubtless be issued to liquidate the claims.

Cleveland, Cincinnati, Chicago & St. Louis.—The company's annual report for the year ending June 30 follows:

	1895-'96.	1894-'95.	Inc. or dec.
Gross earn	$13,804,534	$13,625,027	I. $179,507
Oper. exp	10,293,703	10,254,068	I. 39,635
Net earn	$3,410,831	$3,370,959	I. $39,872
Charges	2,844,509	2,844,705	D. 196
Surplus	$566,321	$526,253	I. $40,068
Other income	7,792	23,372	D. 15,580
All income	$574,114	$549,626	I. $24,488
Dividends	500,000	500,000	
Balance (surplus)	$74,114	$49,626	I. $24,488

President Ingalls in his comments on the report says: Our rate per ton per mile has fallen slightly, owing to a larger increase of through business than of local. Notwithstanding the decrease in rate, however, our earnings per freight train mile have increased from $1.45 to $1.54, which is very creditable to the transportation department. Our passenger train earnings have increased from 95 cents per mile to $1.01, which is very gratifying, considering the competition to which we have been subjected. There has been charged during the year to construction, for improvements at Riverside (near Cincinnati), $47,972; for improvements at Columbus, O., $45,059; for a portion of the cost of Wabash shops, $38,348; for improvements at Alton, $13,410; for new warehouses at Benton Harbor, $11,797; for new sidings at various points along the line, $44,495. Other than this, all additions and improvements have been charged to operating expenses.

Columbus, Toledo & Hocking.—Vice-President Davis says of the issue of $30,000,000 of four per cent. gold bonds authorized by the stockholders but about $2,500,000 are to be issued at present. These are to be exchanged for branch line guaranteed securities and securities in the company's treasury, making the treasury securities available for the further needs of the company. No other bonds are to be issued until arrangements are made to take up the seven per cent. first mortgage bonds, due in October, 1897.

Gulf & Ship Island.—The Receiver of this road was discharged by the court on September, and the road, together with its properties and franchises, passed into the hands of the Bradford Construction Co., of Bradford, Pa. This change in the affairs insures the further building of the road and the improvement of its terminal facilities at Gulfport.

Kings County Elevated.—The company reports earnings as follows for the fiscal year ending June 30:

	1896	1895.	1894.
Gross earn	$767,337	$804,507	$742,228
Oper. exp	512,752	504,717	508,972
Net earn	$254,585	$299 790	$233.256
Other income	14,400	13,806	202
Total income	$268,985	$313,596	$223 458
Fixed charges	365,034	355,273	335,679
Deficit	$96,049	$41,677	$102,221

Knoxville, Cumberland Gap & Louisville.—Judge J. M. Barton, of Chattanooga, has rendered an opinion in the suit brought by the railroad against the city of Knoxville for $225,000, claimed to be due the railroad as the subscription voted by the city to the stock of the railroad. The decision is in favor of the city. It will now go to the Supreme Court for confirmation.

Long Island.—The company reports earnings for the fiscal year ending June 30 as follows;

	1896.	1895.	1894.
Gross earn	$3,962,799	$4,014,019	$4,148,423
Oper. exp	2,541,636	2,593,326	2,690,085
Net earn	$1,421,163	$1,420,653	$1,458,348
Other income	155,654	163,276	102,398
Total net	$1,576,817	$1,583,969	$1,555,746
Interest on bonds	658,411	658,410	589,528
Taxes	200,973	174,531	172,776
Rentals	271 160	240 088	240,768
Int. and dis	16,389	6,789	33,069
Dividends	480,000	480,000	570,000
Total charges	$1,626,933	$1,559 818	$1,606,091
Balance	D. 50,116	S. 24,151	D. 50,345

Memphis & Charleston.—The report of the Receivers for the fiscal year ending June 30 shows: Balance in the hands of Receivers June 30, 1895, $166,726; received during the year, $1,860,894; total, $2,027,621; disbursed, $1,990,945; balance, $36,675. On July 1, 1896, the Receivers' liabilities, including $1,031,700 for interest on the bonded debt, due and unpaid, exceeded their resources by $964,347. Liabilities do not include Receivers' car trust notes outstanding, aggregating $106,075. By authority of the Court interest payments were made aggregating $356,531. The amount of interest due and unpaid July 1, 1896, was $1,031,735. The gross earnings for the year were $1,348,538; operating expenses, including taxes and rentals, $1,060,255; net earnings, $288,282. Compared with 1895, gross earnings increased $146,265; operating expenses increased $30,530; net earnings increased $115,734.

Minneapolis, St. Paul & Sault Ste. Marie.—The company reports its earnings for the year ending June 30, as follows:

	1896.	1895	Inc.
Gross earn	$3.735,872	$2,557.275	$1,178.597
Oper. exp	2.307 263	1.779,560	527.703
Net earn	$1,428,609	$777,715	$650,894
Fixed charges	1,323,953	1.291.714	32.239
Surplus	$104.656	Def. $513,999	$618,655

Norfolk & Western.—The Shenandoah Valley division was sold at Roanoke, Va., Sept. 16. The only bid was by Mr. George Coppell for the Reorganization Committee, and was for $1,500,000, the minimum allowed by the decree of the court.

Norfolk, Virginia Beach & Southern.—This road, which succeeds the Norfolk, Albemarle & Atlantic, has filed a mortgage with the Guaranty Trust Co., of New York to secure a payment of $500,000 in 5 per cent. bonds. It is understood these bonds are to be used in carrying out extensive improvements on this road and Virginia Beach, its summer resort at the terminus. The road extends from Norfolk, Va., to Virginia Beach, 17 miles.

Ohio Southern.—The sale of this road was ordered by the United States Court, on Sept. 14. The line is 200 miles long, and extends from Wellston to Lima, O. The sale will take place some time this fall.

Old Colony.—The thirty-first annual report of the road, under lease to the New York, New Haven & Hartford, shows as follows:

Year June 30:	1895-96.	1894-95.	Increase.
Rec. rental	$1,768,966	$1,678,390	$90.576
Expenses	13,438	10,107	3,331
Interest paid	667,791	643.903	23,888
Dividends	1.087,737	1.024,380	63,357

The balance sheet June 30 shows cash on hand, $377,836, and profit and loss surplus, $779,099.

President C. F. Choate in his report says: "The improvement at Brockton is now nearly completed, and the elevation of the tracks of the Boston & Providence road will probably be finished in the current year. Work has been resumed upon the third and fourth tracks to Braintree, and a fourth track extended on the Providence division to Hyde Park. The net charges to construction and property accounts are $2,410,781. Among items included were: Land and land damages, $287,551; Nantasket Beach second track and electrical equipment, $213,630; elimination of grade crossings, main division, $806,431; elimination of grade crossings, Providence division, $838,136.

"To meet this expenditure in part 8,000 shares of stock have been sold for $1,410,581, and 4 per cent. bonds sold realizing $953,000, or a total of $2,363,581. The difference in these amounts is shown in an increase of the floating debt, of which, however, $235,900 has been paid with money received from the State on the grade crossing account since June 30, 1896. The full amount expended for the abolition of grade crossings during the year was $2,694,837, of which $1,050,268 has been paid to the company by the state, cities and towns.

Philadelphia & Reading.—The United States Circuit Court, at Philadelphia, has refused to grant the motion asked by W. W. Kurtz and other bondholders to enjoin the sale at foreclosure.

St. Louis Southwestern.—The annual report to June 30, just issued, gives the following comparisons of earnings for 1896 and 1895:

Year June 30:	1896.	1895.	Inc. or dec.
Gross earn	$4,904,489	$5,217,175	D. $312,686
Oper. exp	4 132,374	3,977,221	I. 155,153
Net earn	$772 115	$1,239 954	D. $467,839
Other income	10,077	24,319	D. 14.242
Total net	$782,192	$1.261,273	D. $482,081
Fixed charges	959,542	958,083	I. 1,459
Balance (def.)	$177,350	(Sur.) $303.190	D. $483,540

Richmond, Nicholasville, Irvine & Beattyville.—This road will be sold in Versailles, Ky., Oct. 10, by order of the United States Circuit Court, to foreclose a mortgage held by the Central Trust Co. of New York. This is the second attempt to dispose of the road, there being no bidders on June 9, when first offered. The upset price has been reduced from $500,000 to $250,000. The road extends from Versailles to Irvine, in Estill County, a distance of 61 miles, and all the grading is completed for the extension southeast to Beattyville, 20 miles further, in the coal region. The road has been in operation to Irvine for six years and has been in the hands of a Receiver for five years.

Terre Haute & Peoria.—Default having been made in the payment of the interest upon the first mortgage 5 per cent. 50-year bonds guaranteed by the Terre Haute & Indianapolis, Mark T. Cox and James A. Blair, of New York, and James W. Paul, Jr., of Philadelphia, are acting as a committee to represent the interests of the bondholders. Messrs. Cox and Blair are members of a similar committee of holders of Indiana & Lake Michigan 5-per cent. bonds, interest on which has also been defaulted by the Terre Haute & Indianapolis.

Wagner Palace Car Co.—The company reports the results of operations in twenty states and Canada for the fiscal year ending June 30, as follows:

	1896.	1895.	Inc.
Gross earn	$3,660,333	$3.368,942	$291,391
Oper. exp	2.092,442	1,808,755	283,687
Surplus	$1,567,891	$1,560.187	$7,704

Wheeling & Lake Erie.—The company reports for the fiscal year ending June 30, as follows:

	1896.	1895	1894.
Gross earn	$1,453.916	$1,353,824	*$1,367,648
Oper. exp	1,058,194	995,443	853,194
Net earn	$395.722	$358.381	$514.454
P. c. exp. to earn	72¾	73½	66¼
Total income	486,350	451,811	514.454
Taxes	41.460	39,492	40,787
Balance	$444,890	$412,390	$473,667
Interest, etc	379,778	378,575	505,857
Surplus	$65,112	$33,744	Def. $32,190

*Including "other incomes."

The balance sheet shows cash on hand $163,232. The report shows that the average rate per ton per mile has been increased, with a decrease in the cost of transportation. There has been an increase in the earnings per train mile and also in the number of tons carried per train. Freight earnings constituted 85.53 per cent. of the total, compared with 82.80 per cent. in 1895. Operating expenses were 72.78 per cent., against 73.53 per cent. Rates were the lowest which the company has had in its history. Steel bridges are being substituted for wooden structures. Nineteen spans are already under contract. Twelve engines and 1,000 30-ton gondola cars have been added to the equipment.

Electric Railroad News.

Milwaukee, Wis.—On Sept. 17, the Milwaukee, Racine & Kenosha Electric Railway Co. filed a mortgage of $300,000 to cover a bond issue to enable it to build its lines. Surveys on the new road were begun Aug. 12. As originally intended the road was to be 20 miles in length, and cost $2,000,000.

Philadelphia.—The Union Traction Co. has completed arrangements to run a through line of cars between the suburb of Angora and the business center of Philadelphia, by way of Baltimore avenue and Chestnut and Walnut streets. The cars will run on five minutes headway.

St. Thomas, Ont.—Negotiations are pending for the sale of the line of St. Thomas Street Railway Co. to a Cleveland company.

Washington, D. C.—On September 21 the Eckington & Soldiers' Home Railway Co. and the Maryland & Washington Railway Co. went into the hands of W. K. Schoepf as Receiver. The latter line, known as the Belt line, also as the Columbia & Maryland Railroad, has been frequently referred to among our notes, and separate articles appeared April 24 and July 17 in reference to the construction: The Eckington line originally had an overhead trolley from Seventh street and New York avenue by Fourth street northeast to the Soldiers' Home and the Catholic University. Later it was compelled to tear down its trolley within city limits. The total indebtedness of the construction company for work actually done and goods delivered was stated to be not over $270,000. It is believed that the contracts for supplies, consisting of engines, cars and equipment, will increase the amount to more than $1,000,000.

TRAFFIC.

Traffic Notes.

The Galveston Wharf Company is to build two new grain elevators, one to hold 500,000 bu. and the other 250,000.

The Southern Pacific has made a low through rate on dried fruit from California to European cities, by vessels from New Orleans.

The Baltimore & Ohio Southwestern has given notice of withdrawal from the Cincinnati St. Louis agreement covering party rate passenger business.

The recent advance in the freight rate on anthracite coal from the mines in Pennsylvania to cities in the West has led to the shipment of coal from Philadelphia to Buffalo by the Erie Canal, large numbers of boats having been already loaded at Port Reading to go to Buffalo.

On Friday last the arbitrators of the Joint Traffic Association listened to arguments for and against changing the differentials on passenger fares from New York City to Chicago. The question of differentials between New York and Buffalo was also heard, but no decision has been issued on either subject. The rate from New York to Buffalo is $8 by all lines except the New York Central, on which it is $9.25, and the recent increase of speed on the Lehigh Valley is put forward by some of the roads as a reason why the rate on the Lehigh Valley should be raised. The Baltimore & Ohio has asked for a differential on the passenger rates from New York and Philadelphia to Pittsburgh, but it is said that the managers of the Joint Traffic Association have decided that this question ought to be settled by the two roads interested.

The committee of the New York Produce Exchange which recently sent to the Interstate Commerce Commission a complaint concerning the rates for the transportation of grain to the seaboard over the Trunk lines, last week sent an amendment to the complaint, quoting statements from the annual report of the Chesapeake & Ohio Railroad showing the payments made by the road to the Chesapeake & Ohio Steamship Co. during the last fiscal year. The rates for carrying grain to Europe were so low that the railroad received no income on its steamship stock, and yet, under the contract with the steamship company, the road had paid over $174,511, besides an additional sum of $39,128 which was necessary to purchase and retire certain mortgage bonds. The sum of these two amounts, $213,650, is alleged by complainants to be equivalent to a rebate on export shipments, and therefore a discrimination against other shippers. Violation of the Interstate Commerce Law is charged.

The condition of the transatlantic freight market is described by the New York News Bureau as follows: "Within the last few weeks the ocean freight market at New York has passed from a period of almost complete stagnation to one of exceptional activity. During that time rates have more than doubled. Five weeks ago the rate on grain to Liverpool was going begging at 1¾d. per bushel. To-day it was difficult to secure room at 4¼d. The same marked rate of increase is also noted to other English and Continental points. All this is largely the result of recent pronounced activity in the export demand for American grain, due to low supplies in European markets. Shippers have gobbled up all the available room for months ahead, some of the steamship charters running into January. At the same time it is understood that not a little room has been secured by speculators, who anticipate even a further advance in rates. Just how much room has been engaged so far is difficult to learn, owing to the secrecy of shippers, but it is undoubtedly very large. For Liverpool alone this week not less than 50 loads have been engaged at 4 to 4¼d. for October and November, with every probability of a much larger business that the freight men will not report."

Chicago Traffic Matters.

CHICAGO, Sept. 23, 1896.

The roads east of Chicago are still having trouble over return tickets from the G. A. R. encampment at St. Paul. The Erie and the Grand Trunk refused to accept any unstamped tickets, greatly inconveniencing many legitimate holders. It has just been discovered that Chicago and St. Paul brokers have been using a forged joint agent stamp, but the eastbound roads have adopted a plan to stop this manipulation.

The long-winded lake-and-rail war on traffic from Chicago to the Northwest has been settled, but possibly not so thoroughly as has appeared. The new rates, effective Oct. 1, are announced as follows:

	1	2	3	4	5	B	C	D	E
All rail	60	50	40	25	20	17	16	14	13
Ferry	55	45	35	21½	18½	17	15	13	12
Lake Superior line	50	40	30	18	16	14	13½	12	11

Officers of the ferry line still say they will treat these rates only as an experiment.

The Soo Line recently reduced the lake and rail flour rate, St. Paul to New York, from 25 cents to 22½ cents per 100 lbs. To meet this rate the Western lines in connection with the lake lines have announced the same rate via this city.

The Central Freight Committee, at its meeting in this city, declined to recommend any reduction in the corn rate from Chicago to New York. The Lake Shore representative introduced a resolution providing for a reduction of the rate to 15 cents, also for a reduction of the provision rate from 30 to 25 cents per 100 lbs., but this was voted down.

The Chicago fruit market is glutted and fruit merchants are offering their surplus in the trans-Mississippi country at very low figures. This, together with the large movement from Ohio, Indiana and Illinois to the West, has caused the railroads to enter into sharp competition for the traffic. The rate on grapes from Chicago to the Missouri River has dropped from 47 to 20 cents per 100 lbs. Now the Burlington announces that it will apply the same rate to apples and will reduce the rate on both from the Mississippi to the Missouri to 15 cents. Most of Chicago's fruit comes from Michigan by boats. The rate on canned goods, Chicago to the Missouri River, has been lowered from 27 to 17 cents.

The Board of Managers has disapproved the recommendation of the Central Passenger Committee that the eastbound lines join the Chicago-St. Paul roads in putting in a one-way rate, St. Paul to New York via Chicago, of $18 to meet Soo competition.

The Interstate Commerce Commission has been in session in this city for the past ten days, but its work has been of little interest. It promises to take up the alleged Western freight pool and the Kansas City grain rate cases this week. Evidence given at the hearing last Friday by an agent of the Illinois Central was to the effect that it is necessary to make the rate to Europe from Chicago 4 or 5 cents less than the rate via New York in order to get any business by way of New Orleans.

Western roads have agreed to make slight advances in corn rates from the trans-Missouri territory to Chicago. The advance will average about 5 cents per 100 lbs., but will not apply from Missouri River points.

To even up its percentage the Erie ran an excursion from Huntington, Ind., to Chicago, last Sunday, bringing in 1,300 people.

Roads of the Western Passenger Association have agreed to make a round-trip rate of one fare for parties of 40 or more going from any point in Eastern committee territory (east of the Missouri River) to Canton, O., to visit the Republican presidental nominee. This rate will be based upon the schedule of rates already agreed upon by the lines east of this city.

Total shipments from Chicago to the East by lake last week amounted to 109,813 tons, of which 91,665 tons were grain. Total shipments by rail, exclusive of live stock, footed up 63,387 tons, compared to 61,846 tons for the preceding week, an increase of 1,541 tons, and against 60,978 tons for the corresponding week of last year. Last week's traffic was carried by the roads in the following proportions:

Roads.	WEEK TO SEPT. 19.		WEEK TO SEPT. 12.	
	Tons.	p. c.	Tons.	p. c.
Michigan Central	7,338	11 6	7,098	11.5
Wabash	5,112	8.0	6,546	10.6
L. S. & M. S.	8.230	13.0	9.409	13.1
Pitts., Ft. Wayne & Chicago	8,350	13.2	6,174	10.0
Baltmore & Ohio	7,015	11.1	5 928	9.6
Pitts., Cin., Chi. & St. Louis	5.557	8.7	4,685	7.6
Grand Trunk	6.387	10.1	7,145	11.6
N. Y. C. & St. L.	6.613	10.5	6,177	10.0
Erie	5,766	9.1	5,766	9.3
C., C., C. & St. Louis	2,994	4.9	2,918	4.7
Totals	63,387	100.0	61,846	100.0

Of the above shipments, 3,198 tons were flour, 24,857 tons were grain, 13,189 tons provisions, 9,978 tons dressed beef, 2,302 tons butter, 2,060 tons hides and 3,179 tons lumber.